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OF

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PART I.—JANUARY TO DECEMBER, 1844.

ORIGINAL COMMUNICATIONS.

"A body of men engaged in the same pursuit, form a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all."—REV. DR. WILLIAM CAREY.

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THE JOURNAL

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Agricultural & Horticultural Society

OF

INDIA.

A few Observations on Tea Culture, by J. W. MASTERS, ESQ. *late Superintendent of Tea Plantations in Assam. Presented by Major* FRANCIS JENKINS, *Commissioner of Assam.*

[This communication was drawn up by Mr. Masters at the request of Major Jenkins, the indefatigable Commissioner of Assam, who conceiving that Notes "founded on Mr. Masters' long experience and intimate knowledge of the Asssm tea plant,"* would be very generally acceptable, forwarded them to the Society for publication. It appears to the Committee of Papers to be the most scientific and practical of all that have hitherto come before the public. For it gives the opinion of the only person connected with the tea cultivation in Assam, who, by previous horticultural training and particular acquirements, was competent to grapple with a subject of considerable difficulty. It will be seen, that it holds out what Mr. Masters considers satisfactory reasons in favour of an advantageous result of a proper system of cultivation, in which Major Jenkins entirely agrees. But the Committee have to remark, that it does not in any way refer to the important question of the identity or non-identity of the Assam tea plant with that of China, which should, the Committee conceive, be satisfactorily disposed of, before any scheme of cultivation, chiefly or entirely regarding the indigenous Assam plant, can be proposed with that degree of probability that would authorize private speculations.]

The most desirable *barrees*, and the most convenient sites for carrying on the manufacture of tea, are those in which operations have already been commenced by the Assam Company; as Satsoeah, Rokan, Gabharoo, and Choindro. The principal of these is Satsoeah, in which forest the culti-

* Major Jenkins, in a letter to the Secretary, forwarding the communication.

vation may be increased to any desirable extent. There is now producible tea land, to the extent of about 400 poorahs,* one-third of which has been planted since January 1840. The new cleared land, either sown or planted, will complete 500 poorahs. I am induced to think, that land to that extent is now occupied by tea, though in some places the plants are small and scattered. No satisfactory account has yet been given of the exact extent of land occupied by tea in any one *barree* with which I am acquainted; at least I have not seen a positively correct statement. Satsoeah being within one hour's walk of the Dikho river, being surrounded by villages and rice cultivation, and having the Dhodur Alley and Bans Gur running through it, is certainly the most valuable tea locality known.

2d. Next in importance to Satsoeah, is Rokan, in the vicinity of which there is an extent of about 400 poorahs, occupied by tea, but the plants are smaller, not so thick on the ground, and the *barrees* do not lie so compactly together as in Satsoeah. The ground also is much broken and intersected by water-courses; there are no villages, nor any cultivation in the immediate vicinity; much of the land is well adapted for tea cultivation, which may be increased to the extent of about 10,000 poorahs in that forest. This locality, as respects the productive powers of the plants, and state of the *barrees* altogether, may be considered to be about two years behind Satsoeah.

3d. Gabhatoo Purbut contains about 30 poorahs of producible tea-land, one-third of which has been planted since January 1840. The plants are scattered over several small hillocks, with soil of the first rate description for tea cultivation, which may be increased to any extent, but most conveniently to 100 poorahs; it would then form a suitable factory for a private individual to superintend on his own account.

* A poorah is more than an acre and a quarter.

4th. Choindro, with respect to soil and capabilities, very much resembles Gabharoo, and contains also about 30 poorahs of producible tea-land, one-half of which has been planted since January 1840. The cultivation may be extended all over the low hills in the neighbourhood, the soil being of the best kind; and if 100 poorahs be filled up, this locality, like Gabharoo, would form another complete little factory for a single individual.

5th. All the other localities in the Seebsagur district, lie far off from villages and cultivation; or, are beyond what is supposed to be the boundary of the Honourable Company's territory, and are not therefore, (unless taken together with the above by a large Company,) so desirable.

6th. I believe it has been the prevailing opinion, that in order to realize a fortune by the tea plant, nothing more is required than to chop down the surrounding jungle, set fire to it, head-back the long straggling tea plants, and then continue to pick off every leaf that they successively produce; and an incalculable profit will be the result. I am compelled to think otherwise. Still, I consider that tea may be cultivated in this province to considerable advantage. In order to ensure a profitable return from a tea garden, it must be actually cultivated. How is it, that throughout Europe, the crops raised by the Agriculturist and Horticulturist of every kind of cultivatable plant, is now many times more valuable than those raised on the self-same soil 40 years ago? The plants are treated, and the soil cultivated in a superior manner.

7th. I am persuaded, that suitable soil, frequent supplies of manure, with the best possible mode of cultivation, is more essential to the production of tea, than of any other kind of crop. This must be manifest to all those who know any thing about the nature and culture of plants. Leaves are as essential to the well-being of a plant, as roots. A healthy, well-managed tree of any kind, has not a leaf to

spare in the growing season; nor can we remove an active healthy leaf without injury to the branch from which it is taken. Nearly all the nourishment that a tree receives, and by which it is maintained in a healthy state, is conveyed into its system by the united agency of the leaves and roots. "Every bud that produces leaves, produces roots." The leaves and roots thus simultaneously produced, may not continue in a healthy state long enough for the roots to reach the earth; and if the leaves are forcibly removed, the roots will certainly suffer injury, whether they have reached the earth or not. The number and the healthy state of the roots, therefore, will be proportionate to the number and healthy state of the leaves. A healthy tea tree 5 or 6 years old, with from 4 to 8 leading branches, well clothed with young shoots and leaves, will have a proportionate root, the fibres of which running down to the points, end at the absorbent spongioles; if the tree be deprived of leaves, and of the power of developing leaves, the roots also will be proportionately deficient.

8th. In April 1843, I visited the Tingri tea *barrees*, in which I found many stunted plants, having only a single tap-root, without any branching fibres; these plants were more than 7 years old, having been found there in 1835-6, by the Deputation; ever since that time, the garden had been under, what is called cultivation; but it is evident the garden had never been brought under cultivation at all. The forest trees had been cut down and removed, but the tea plants had never been regulated, nor the ground properly dug. In some places, the plants were standing six or eight on a square foot of ground, and even where they stood sufficiently distant from each other, and had at the first formed good heads, but the leaves, having been picked off two or three times a year, and no manure or other stimulant applied to the roots, the plants were actually starved. I fear that Chubwa, and all the other Government *barrees*,

together with Kuhung, (once the finest in the province,) are rapidly verging towards the same state, "*worn out.*"

9th. Respiration, perspiration, and digestion take place through the leaves, they are the lungs and stomach of a plant. "Of the vital functions of plants, none are more important than those of perspiration and evaporation; and while a certain amount of loss of their fluid particle is necessary, a great excess or diminution of the loss must be injurious." "Whatever tends to impede the free action of the leaves, tends also to diminish the healthiness of a plant," (Lindley.) The functions of leaves are brought into operation by the agency of light; and the tea plant is more or less healthy according to the quantity of light which it receives, provided the roots are supplied with a sufficient quantity of nutriment, and all the functions are in full operation. I have never seen a strong healthy tea plant having a head proportionate to its length of stem, growing in dense shade. The most healthy plants I have seen, both among seedlings and full grown trees, have been exposed to the full sunshine.

10th. In order to supply a sufficient quantity of nutriment to the plant, and to ensure a good crop of leaves every season, it is absolutely necessary that the ground be brought into a proper state of cultivation: if a plant will not pay for the best possible culture, it will certainly not pay for slovenly treatment. Each plant should have sufficient space of ground to itself, at the least twenty-five square feet, and all the ground should be well dug, not once only, but frequently, and turned up, and exposed to the action of the sun and air, be kept clear from weeds, and have a good coat of suitable manure every cold season.

11th. The soil in which the tea plant is found growing in the Sibsagur district, is composed of 70 or 80 per cent. of silex in the state of fine sand; of from 6 to 12 per cent. of alumina; of from 4 to 9 per cent. of oxide of iron; with

from 5 to 10 per cent. of vegetable matter. On an average of-

Silex, in different degrees of fineness, ...	78	0
Alumina, ...	8	0
Oxide of Iron, ...	6	5
Vegetable matter, ...	7	5
	100	0

with occasional small traces of lime. Dr. M'Clelland, in his analysis of the soil at Gabharoo, mentions having found nearly one per cent. of lime. I have not met with any visible trace of lime in the different specimens that I have examined myself. On the hills, the silex appears to be in greater proportion, as there it occurs in the state of coarse sand or fine gravel; whereas in the plains, it exists in the state of very fine sand, or almost impalpable powder. The general appearance is that of a red or yellow clay, differing in colour from red to brown, orange, and even pale yellow; when dry, it often appears white, if the sand be very fine, deepening in colour in proportion to the quantity of moisture.

12th. What would be the most suitable manure to apply to a tea garden, can be discovered by no other means than a careful examination of the soil, thereby ascertaining what it is deficient in, and what is in excess. Generally, there is plenty of vegetable manure at hand, a moderate dressing of which, will seldom fail to do good. In the numerous ravines, hollows, and other low places, so common in the tea localities, a large quantity of manure may be obtained; a mixture of various substances, animal, vegetable, mineral and gaseous; this taken out, thrown into a heap, turned over two or three times, or spread at once on the ground to be dug in after three or four days, will generally be very beneficial. Burning a large quantity of trees, branches, grass, and rubbish, and spreading the ashes and charcoal over the ground, will always do good. As char-

coal is capable of absorbing gaseous substances from the air, and saline ones from water, this kind of dressing may tend to keep the oxide of iron in proper state and proportion in the soil; its good effects on the tea plant, are evidently shewn by its healthy appearance and vigorous shoots. Good culture, frequent stirring, and turning up the soil to the action of the sun and air, is absolutely necessary; without this process, no amount of manure will effect the desired end.

13th. I am persuaded, that to cultivate and manufacture tea in Assam, under existing circumstances, will cost 10 rupees per poorah per mensem, or 120 rupees per annum; and that the average produce of a poorah in a fair crop, may be estimated @ 400 lbs., giving about 3 lbs. per rupee in the factory. So that to cultivate the 30 poorahs at Gabharoo or Choindro would cost 3,600 rupees, and the outturn probably be 9,000 lbs., as all the plants are not in full bearing, but may yield

From 20 poorahs, 400 lbs. each = 8,000 lbs.
From 10 poorahs, 100 lbs. each = 1,000 lbs.

Increasing the cultivation to 100 poorahs, would cost 3,500 rupees, 70 poorahs @ 50 rupees per poorah. At the same rate, the cultivation and manufacture at Satsoeah or Rokan, of the tea from 400 poorahs, would cost 48,000 rupees, and the probable out-turn be 110,000 lbs. at Satsoeah, and 75,000 lbs. at Rokan.

	Poorahs.		*lbs.*		*lbs.*
Satsoeah, ...	200	@	400	=	80,000
	100	,,	200	=	20,000
	100	,,	100	=	10,000
Rokan, ...	100	,,	400	=	40,000.
	100	,,	200	=	20,000
	100	,,	100	=	10,000
	100	,,	50	=	5,000

The above estimate is made under the supposition, that the gardens should be kept in proper cultivation. I do not expect that the present season's crop will equal the estimate; but I am confident to affirm, that under good culture, with every facility afforded in time of manufacture, there is nothing in the soil, in the tree, nor in the climate, that could prevent Satsoeah from yielding 100,000 lbs.

14th. To clear 100 poorahs of forest land in a proper manner, for the reception of tea seeds, will cost @ the rate of 50 rupees per poorah, ...	Rs. 5,000
10 maunds of seed @ 80, ...	800
Cultivating for one year, erecting buildings, and making other preparations, ...	12,000
Six years' annual expenditure, ...	72,000
100 poorahs of new made tea land, will thus at the end of seven years, have cost, ...	89,800
And may then be expected to yield an average crop of 400 lbs. per poorah, ...	40,000

15th. The value of cultivated tea-land depends in a great measure on its situation, the age of the trees, and the mode of culture to which it has been subjected. A poorah of properly prepared land, with the young plants all appearing above ground, at the regular distance of five feet from each other, is well worth 100 rupees. A poorah of indigenous tea-land, which has been properly cleared, the plants all having been headed, and under good culture for one year, is worth 150 rupees, and a poorah of tea-land in full bearing, under good culture, with not less than 15,000 plants, is worth 300 rupees.

(Signed) J. W. Masters.

Sibsagur, 29th May, 1844.

Report of Proceedings regarding the inspection of lands best suited for the Cultivation of Foreign Cotton in the district of Dacca. By J. O. Price, Esq.

(Communicated by the Government of Bengal.)

To James Hume, *Esq. Honorary Secretary, Agricultural and Horticultural Society.*

Revenue Fort William, 17th June, 1844.

Sir,—In reply to your letter dated the 15th instant, I have the honor, by direction of the Deputy Governor, to forward for the use of the Society, copy of Mr. J. O. Price's Reports of his proceedings during the first seven months of his employment, up to the 30th April last.

I have, &c.

C. Beadon,

Under Secretary to Government of Bengal.

To F. J. Halliday, Esq. *Secretary to the Government of Bengal, General Department.*

Sir,—In obedience to instructions received on my appointment, I have the honor to report for the information of His Honor the Deputy Governor of Bengal, my progress in the inspection of lands in the last month.

On my arrival in Dacca, I proceeded up the Delussury and Conai rivers to the boundary of Mymunsingh, and examined the banks on both sides, neither of which I found suited for cotton cultivation, the best lands there being all very low, and subject to early inundation and a long continuation of it.

I returned to Dacca on the 12th, when I found the lands in that neighbourhood to consist of stiff red clay, therefore badly suited for American seed, as it requires frequent clearing and moulding for three months after planting; this would be impossible to do here, from the extreme hardness of the soil in any season approaching to dry weather.

My last inspection of land was on the Lucky, a river where I found the best cotton soil I have seen in this country, and I have reason to hope that there is still finer land on the Megna and Burrumpooter rivers; my inspection of which I will duly report. It was there, I am informed, that the greater part of the fine Dacca cotton was formerly grown.

It is my intention to visit the districts I find best adapted to the growth of the Cotton plant, as often during the season as in my power, so as to be the better able to judge of the nature of the land most retentive of moisture during the dry season in this country, and least cohesive, so as to admit of frequent cultivation. On my stating this to Mr. Wise, a very influential Indigo Planter in this district, he kindly offered me the use of several patches of land, each on different properties, but in different parts of Dacca; also one near the Tipperah Mountains, where the natives grow a large quantity of cotton, but of an inferior kind; but this may be occasioned from a bad kind of seed, and the careless mode of cultivation they practise, besides mixing a number of crops through each other.

I wrote to you on the 16th of last month, stating Mr. W.'s offer to me, requesting you at the same time, should it meet with His Honor the Deputy Governor's approbation, to order the seed to be sent up as soon as possible, as it is now the best season for planting cotton. Hoping soon to have the honor of hearing from you on that subject,

I remain, &c.

(Signed) J. O. Price.

November 1st, 1843.

Sir,—I have the honor of submitting to you, for the information of His Honor the Deputy Governor of Bengal, my November Monthly Report of my inspection of cotton lands in the Dacca district and elsewhere.

In my last report, I mentioned my hopes of finding superior cotton lands on the Burrumpooter river, and on the upper part of the Megna in this district; but not having received the cotton seed, which I had the honor of writing to you for, I deferred visiting that part of the country for a time, as some of the factories belonging to Messrs. Wise and Glass are in that neighbourhood in which I wish to try the experiment with the American cotton seed.

Early in this month I visited Luckipore, and was much disappointed in finding the land to consist principally of light sand, besides being very low; still this may prevent (which I am told it does) their crops from scorching in the dry season. The ryots informed me where they planted the cotton singly, that they got a fair proportion of produce from it, but this is seldom done. Further to the southward, I understand they grow a large quantity of cotton, and cultivate it better.

I regretted that it was not in my power to visit the islands of Hattia and Sundeep, my boat not being sufficiently safe to do so, but from all the information I could obtain at Luckipore of the soil, and the large crops that the inhabitants get from their lands, besides the great advantage of sea air, which is of very essential service to cotton, I am inclined to be of opinion, that all those islands in the river verging on the sea, are well suited for the growth of American cotton.

On my return up to this district, I visited Patta Hat; the lands where the old Government factories were are rather low, but have been well drained, and at a great expense, by Government; but the ryots have in some measure stopped the ditches up, so as to cultivate paddy on it. The ryots that do plant cotton there, say, they seldom got two good crops in succession from the same land; this may be occasioned by the mode of cultivation, which is the worst I have seen in any place I have yet been.

As I proceeded up the river from Patta Hat, I examined the land on several places on each side of the river, much of which appeared only to want a fair system of cultivation to suit the growth of the cotton plant, and particularly so on an island called Bobchur, situated where the river Megna and Issamutty unite, and which is in the Dacca district.

I regret much not having yet received the cotton seed, as the season will be getting too late for planting the cotton. Every place I have been lately at, is planted, and the ryots say, the earlier they plant it the better, as the cotton has obtained by that means sufficient strength to stand the cold weather in December and January; this stands to reason. I have often seen our young cotton much chilled in America in the latter end of March, and in the early part of April, from cold winds,

I remain, &c.
(Signed) J. O. PRICE.

December 1st, 1843.

SIR,—I have the honor to submit to you, for the information of His Honor the Deputy Governor of Bengal, the Monthly Report of my proceedings for the month of December.

2d. On the 6th instant, I received three packages of cotton seed, two of acclimated New Orleans and one of Bourbon. I am afraid it has arrived too late in the season to yield largely this crop, but the hopes of being enabled to judge safely of the soil in this country best suited for the cultivation of the cotton plant, has induced me to plant it in a number of places, which I have been enabled to do in a great measure through the kindness of Messrs. Wise and Glass, by their sending several parcels of the cotton seed, which I gave them, to their factories on the Luckia and Burrumpooter rivers, that it would have been impossible for me to have visited in this month. I also gave them the neces-

sary instructions to send with the seed respecting the cultivation that they should pursue, until I could visit each place personally. I also planted seed in three places myself, one place in Furreedpore district, and two in Dacca district. I hope to be enabled to judge by this late planting, how late in the season cotton seed can be safely planted in this country, and how late it would be safe to supply in case of having planted bad seed. Since planting the seed in Furreedpore, I have visited it, and found it coming up well; also one of the places in Dacca district promises well; the other place I planted myself was on the Megna, and I received a letter to-day, speaking very favorably of its appearance. I think it will do well at the latter place, if the early inundation of that district of country does not prevent its doing so. I have retained a small parcel of each kind of seed, to try how planting in April or May will do on the high lands.

3d. I have not yet been able to visit the islands of Sundeep and Hattia, but I hope soon to be able to do so.

I remain, &c.

January 1st, 1844. (Signed) J. O. PRICE.

SIR,—I have the honor to submit to you, for the information of His Honor the Deputy Governor of Bengal, the Monthly Report of my proceedings for the month of January.

2d. Early in this month, I proceeded up the river Bunsee; in that district of Dacca I find the inhabitants generally grow cotton more or less, and I have much pleasure in reporting, that I found the triennial kind scarcely able to bear the weight of bowls that was on it; it has a fine silky staple, and the ryots informed me, that they get from twelve annas to a rupee per maund more for it than for the annual kind, which is also much grown there; but of it I could not judge so well, as they had finished picking it when I was there.

The triennial cotton would be more generally grown in this district, but from its spreading quality, it interferes with the other mixed crops that the natives plant through their cotton fields. The soil I found to consist of about two-thirds stiff red clay, and one of sand and marl, and from the stiffness of the red soil in that neighbourhood, the planting season is from April to June, or as soon as the rains enable the ryots to cultivate.

3d. On my return from the Bunsee, I visited two of the places that I have planted with cotton seed, one in Furreedpore and the other in Dacca district, and as I anticipated in my last Report, the young cotton was suffering from the late planting and the cold weather; but as the season is now getting warmer, and the fine rains it is now getting, I am in hopes it will soon recover at both places.

4th. From thence I proceeded down the river Delussury in the south-western part of this district; the land there is high, and in some places very good; there the ryots say cotton was largely grown formerly, but from other crops paying them better for their labour, they have left off planting it entirely.

5th. I am at present on my way down the Luckia river from Coppasia, the land of which I have been inspecting, much of which I find is of the same nature as the red soil on the Bunsee, and cotton very generally grown both annual and triennial; the ryots here are also obliged to plant at the same season as on the Bunsee, and from the same reason, namely, the stiffness of the soil.

6th. If I may take the liberty of offering my humble opinion upon the spring season for cotton planting, or as soon as the rains would admit of doing so, from what I have seen of the soil and climate of Bengal, I would much prefer it, when it was practicable, to that of the fall plant, for several reasons; in the first place, the cultivator is sure of seasons for the growth of his plant, and from September

to February, he would also be sure of a dry season to take off his crops, besides which he would not run any risks of losing it by the hail storms of March, which I am informed cotton often suffers much from.

I remain, &c.

(Signed) J. O. PRICE.

February 1st, 1844.

SIR,—I have the honor to submit to you, for the information of His Honor the Deputy Governor of Bengal, the Monthly Report of my proceedings for the month of February.

2d. In the early part of this month, I visited Surrynuddy, on the river Megna, at which place I planted about a begah of land with American and Bourbon cotton seed, and which I have much pleasure in stating, looks uncommonly well; but from its being planted so late in the season, I am afraid the early inundation of that district of country will not allow it time to come to perfection.

3d. After leaving the Megna I visited one of the places on the Luckia, on which Messrs. Wise and Glass had planted about a begah of land, in American and Bourbon cotton seed, but from the soil not being retentive of moisture, very little of the seed came up, and that only lately.

4th. On my return to Dacca, I proceeded up the Dellussury in hopes of finding the two places on that river that I have cotton seed planted on, much improved; but in this I have been disappointed, as very little of the fine showers that fell in the Luckia district, had reached that neighbourhood.

5th. I have just returned from visiting the district on the river Bunsee that I reported favorably of in last month's Report. I find the ryots have just finished picking their triennial cotton; but I could not ascertain from them what quantity of cotton a begah of land is capable of growing, as the ryots never plant that kind of cotton in any place but round

their houses and gardens, and the seed is very easily extracted from the wool, being not at all adhesive, and I am of opinion, the *Scotch churkas* that the Agricultural Society has two specimens of, would be well suited for that description of cotton.

I remain, &c.

(Signed) J. O. PRICE.

March 1st, 1844.

SIR,—I have the honor to submit to you, for the information of His Honor the Deputy Governor of Bengal, the Monthly Report of my proceedings for the month of March.

2d. I have much pleasure in stating, that the two places on the Megna, on which I have cotton cultivated, continue to look healthy and very promising; but I am still afraid, as I before stated, that the early inundation of that district will not allow it time to come to perfection. Had it been planted in October, which is the proper season for planting cotton seed in that part of this district, (instead of December in which month it was planted,) I am quite satisfied it would have yielded abundantly.

3d. I have just returned from visiting the two places on the Delussury river, on which I have also tried the exotic cotton seed; it suffered much at both places during the long continuation of dry weather it had to contend with, besides that of the soil not being so retentive of moisture as that on the Megna.

4th. I have now every hopes, that if preparations are made in sufficient time to plant the annual exotic cotton seed in the month of October, that this district will be found well suited for the cultivation of that plant, and I am the more sanguine in this opinion, from the few experiments I have tried, having had to contend with so many difficulties; namely, in the commencement with late planting; and secondly, with an unusual long continuation of dry weather; and lastly, that of not having used irrigation at any of the places

I planted seed, as I wished to see how far it would succeed with only the cultivation given to cotton in America.

5th. *I have been engaged for the last week, inspecting the Bowal district of Dacca, the greater part of which, I find, is composed of the same stiff red soil as that of Dumroy and Capassia, both of which places seem well suited for the growth of the fine staple triennial cotton.* I purpose planting a small patch of different kinds of cotton seed on this kind of soil in May or June, which is the planting season on the high land, the result of which, I will duly report to you.

I remain, &c.

(Signed) J. O. Price.

April 1st, 1844.

Sir,—I have the honor to submit to you, for the information of His Honor the Deputy Governor of Bengal, the Monthly Report of my proceedings for the month of April.

2d. In the early part of this month, I visited the pergunnah of Cassimpore, and on inspection of the land there, I found them in many places high, and composed of the same red clay as that of Dumroy and Capassia districts.

3d. I next proceeded up the Luckia to where Messrs. Wise and Glass planted a part of the foreign seed that I gave them, but from its not having vegetated until February from want of moisture which the long drought occasioned, it has not proved worth cultivating. From thence I went up the river Banar to where it joins the river Barrumpooter, and examined the land on both sides, the greater part of which is very high, and I think the finest district I have yet seen for May or June planting.

4th. After returning from the Luckia, I went up the river Dellussery, and I am happy in having it in my power to inform you, that one of the places I have exotic cotton seed planted in that district, (that since it has had rain,) it has quite recovered, and is now from two feet and a

half to three feet high; it is now covered with bolls, and in some places much larger than I expected they would have been; but the place on the Furreedpore side of that river, on which I also planted foreign seed, I am sorry to inform you, I found ruined trespass of stock.*

5th. I have not been this month to visit either of the places on the Megna that I have cotton seed planted, having been prevented from doing so by the high winds and uncertain weather we have had in this district during that time, but I hope to be able to report favorably in my next report.

6th. I beg leave enclosd to you a letter that I have receivèd from the Agricultural Society, kindly offering me another supply of the same kind of cotton seed that Government forwarded me in December; this offer of seed I hope Government will accept of, and forward by the first opportunity.† If Government wishes, I will try the spring sowings, which I have a great wish myself to do, besides having got some ryots to say, that they will plant foreign seed if I can procure it for them, which I have promised to do if possible.

I remain, &c.

(Signed) J. Q. Price.

A few Hints regarding Chinese Agriculture, with a translation from a Chinese work on the culture of the Mulberry Tree. By G. Tradescant Lay, Esq.

To James Hume, *Esq. Honorary Secretary, Agricultural and Horticultural Society.*

My dear Sir,—In reply to your letter, August 29, 1843, I beg to tender your Society my best thanks for the honour they have done me. The Queries have been most fully translated, and are now in circulation among the Chinese.

* *Thus in the M. S.*

† The seed alluded to has been transferred to Government, and forwarded to Dacca.—Ed.

I hope on some future occasion to send you a draft at least of the Replies. *I fully concur with you in thinking, that the subject of manures is one of the highest importance. A skilful imitation of the Chinese in this particular, and the exchange of the hoes now in use for others of thrice the weight, applied not once or twice, but ten times if needed, would in my opinion entirely change the average rate of productiveness in Great Britain. Let the same amount of labour be employed in subverting the soil, and the same pains and judgment in the laying up of materials to supply the waste of strength, then we shall have no weeds to deform our fields, no failure of turnip crops, nor any reason why land should not be cropped with wheat, year after year. If wheat exhausts the soil, manure prepared after the Chinese fashion will restore the loss, and if it deposits an excrement hurtful in itself, the sun and the wind will scatter it, if the plough, the hoe and spade afford those elements an opportunity to exert their peculiar powers.

In China the produce increases with the population, since lands to labour, and manures to fatten, increase with it. And this will be the case in England, if our farmers will take a leaf out of Chinaman's book. Happily for him, there are no mathematical dreams about the nature of population and produce, nor any finely drawn theories of political economy to warp his practice, or perplex his wits. I do not disparage sciences, which have always yielded me the highest entertainment. But I think it may be shewn, that if there be a tendency in mankind to multiply in a geometrical progression, there is in the necessaries and luxuries of life, a tendency to multiply after some higher ratio; and that, before we have settled our fundamental theorems of political economy, we should get a thorough acquaintance with what happens in this moiety of the world.

I enclose a translation of an extract from a voluminous native work, that fell under my notice a few weeks ago.

The style of the original is very neat and pithy, but this effect is lost in the rendering, from a wish to be literal.

It was the practice formerly to gather the leaves from a tree, as we know from old pictures, and the remarks appended to them. But now small plants are found to yield the largest leaves, and to be more steady in the quantity they furnish. Plantations may be seen between Canton and Macao as we proceed by the inner passage, reared in conformity with the practice recommended in the work above cited. I am not aware of any serious impediment in the way of extending the culture of the mulberry in various parts of India. In China this tree by stirring up the female to the nurture of the silk-worm, and the consequent arts of spinning and weaving, has rendered her an admirable housewife. Might it not do something for the creatures of retirement in India?

Very truly yours,
G. TRADESCANT LAY.

The Culture of the Mulberry Tree, translated from a Chinese work on Universal Geography. By G. TRADESCANT LAY.

" In the fourth month of the Chinese year, that is, some time in May, when the fruit is ripe, select and crop off one of a dark red colour, thoroughly ripe. This wash clean by shaking it in water. Then take out this clean fruit, and without loss of time plant it at the foot of a cottage garden wall, or beside a well, or in the recess of some unoccupied spot. If you wish to plant several close together, you should chose a garden bed adapted for the purpose of raising kitchen herbs, just as you would do in the method usually pursued in the planting of culinary vegetables. Every house, nay every door, should plant and rear the mulberry seedlings, taking care to transplant and water them from time to time. This is the way to multiply thousands, and tens of thousands in one year.

The method of "compressing," i. e. of propagating the Mulberry Tree.

"As to the tender shoots which issue from the stock of the tree, do not meddle with them till they have acquired a proper length. In the second month, take the branches and bind them about fourteen inches from the point where they join the stock. Use for this purpose coarse string carried cross-wise around the branch. When the binding is complete, smear it over with earth. In the second and fourth month, it is necessary to crop off the leaf buds which happen to appear during those two periods.

"In the fifth month wherein the season of midsummer falls, the buds which have spontaneously come forward, are turned to scions or propagines. It is right then to apply fresh soil to the branches. The scions so developed are increasing in length, and invite you to hasten to refresh them with manured water. In the space of one or two months, the branches shoot white roots into the soil that surrounds them. At the commencement of the following year, whether you have chosen scions, boughs, or branches for the purpose, cut them off and transplant to a different place, in due order.

"The method of transplanting is this:—

"In the first month select an elevated spot where each plant should be allowed eight or nine cubits, (*i. e.* about ten feet) of free space around it. With a hoe open holes not less than two or three inches in depth, nor more than three or four, taking care to make the holes even at the bottom. Then see that the roots of the plant preserve their original position in their hole, whether they be crooked or straight. With a mixture of manure and earth, set them fast. After this process is finished, remove all the portions of the plant till the top of the stock is level with the ground; each month water it with moisture medicated by manure for two or three times. About the 18th day of the second month,

they will begin to shoot; at which time again have recourse to the manured water once or twice.

"In one month, the shoots will attain to one cubit in length, each plant producing one or two fresh shoots daily. In five or six months time, the plants will begin to shoot out lesser branches, with leaves containing buds in their bosoms. These shoots you will do well to take away entirely, leaving not a single lateral one behind, except the one derived from the original tree, with the soil upon it. It is of the highest importance to water it in the first month of the next year, then in the course of the year current, it will grow to the length of six or seven cubits, or at least to four or five cubits. In the twelfth month, cut away the smaller portions of the stem, and leave only three or four inches for the following year. Water it once or twice a day. The latter part of the spring is warm, and hence the stock again shoots out new buds, never mind how many, but remove them all, save one or two. It is highly expedient to guard against birds and beasts. In the fifth and sixth months, you will find some small crooked branches, all of which break off, as they should not be suffered to stay and rob the original stock of its fatness and strength.

"Till they are six or seven cubits higher, lest the wind should shake them and injure the stock, it is needful by means of fine threads, to connect them with each other. In the following year, you may commence plucking the leaves or the maintenance of the silk worms.

"Within the plantations of mulberry, every kind of herbs should not be set indifferently, lest they should rob the ground of its nutriment. You may only plant onions, leeks, and the various sorts of gourds. Whenever you do so, lose no time in watering them, then the mulberry leaf will be more luxuriant. If you meet with any weeds, it will be useful to cut them up."

British Consulate, Canton, April 12, 1844.

Summary of the Correspondence relative to the Moorgavie Plant, &c. forwarded by MR. BOND, *Master Attendant at Balasore. Communicated by* MAJOR A. IRVINE, *Acting Superintendent of Marine.*

To JAMES HUME, ESQ. *Honorary Secretary to the Agricultural and Horticultural Society of India.*

SIR,—In reply to your letter of the 19th ultimo, requesting information regarding the result of the trials made by the Master Attendant and Controller of Government Steamers with rope, &c. made from the Moorvie or Moorgavie plant, I have the pleasure to forward the accompanying memorandum on the subject, prepared from documents in my office.

I have, &c.

A. IRVINE,

Acting Superintendent.

Fort William,
Marine Superintendent's Office,
12th March, 1844.

In November 1838, Mr. A. Bond, Master Attendant of Balasore, forwarded to the Marine Board a sample of flax dressed from the fibres of the *Moorgavie,* a plant resembling the pine-apple, and indigenous to the jungly salt soils along the coast from Kedgeree southward. In his letter accompanying the sample, Mr. Bond stated, that it had been gathered at Balasore on the coast, steeped five days, and then beat out, but not combed. Mr. Bond also informed the Marine Board, that he had found the flax useful on board the H. C. Schooner *Orissa,* it answering excellently as running gear, and that the natives used it in its fresh state for bowstrings.

On the receipt of this sample, the Board caused equal portions of it to be sent respectively to the Master Attendant and the Controller of Steam Vessels, as also demi-officially to the Agricultural Society for their report on the flax.

On the 29th December following, the Master Attendant forwarded to the Board the result of certain experiments which had been made on the portion of the flax sent to him, shewing, that it was not equal in strength to the Europe or Manilla hemp, but that it seemed to take hot tar as well as the latter, and would answer the like purposes generally as those for which the Europe and Manilla cordage is used; the result of the experiments, which however were imperfect, are as follows, extracted from the Master Attendant's letter in question:—

Europe hemp made of sewing twine, (untarred,) broke at	212 lbs.
Harris' patent Colonial bolt rope, (tarred,) broke at	204 lbs.
Manilla hemp, (untarred,) broke at...	188 lbs.
Europe bolt rope, (tarred,) broke at...	168 lbs.
Balasore flax, untarred at Calcutta, broke at... ...	137 lbs.
Ditto spun by Captain Bond, thumb line broke at	135½ lbs.
Europe rope, tarred, broke at......	88 lbs.

The Controller of Steam Vessels merely acknowledged the receipt of the flax sent to him, and suggested, that in order to give it a fair trial, a sufficient quantity should be procured and hackled.

The Marine Board upon this wrote to Mr. Bond at Balasore, requesting him to collect as large a quantity of the article as could be readily obtained, and forward the same, accompanied with information on the following heads: namely, the quantity produced from a certain quantity of the raw material as produced from the ground; the mode of preparation and the expense; together with all the information he could glean on the subject, with a view to enable the Board to report fully on the matter to the Government.

It was not before the month of May following, that the Board received the reply of the Master Attendant of Balasore,

urnishing information on the points requested of him as ollows:—

Quantum of plant required for the manufacture of *one naund* of flax and its expense per maund; 40 maunds of lant brought to Balasore at 3 annas per maund producing 1 eer flax per maund, ...Rs. 7 8 0

Steeping and cleansing the same, at 3 pice per seer, ...	1	14	0
Drying and cleansing, ...	1	8	0
Flax per maund, Rs.	10	14	0

This expense, however, Mr. Bond explained to be somewhat greater than it should be, in consequence of the plant being required to be conveyed about four miles to the place where t was dressed, the Natives on the spot being averse to perorm a contract for a work which their forefathers never ook in hand. The process of steeping, Mr. Bond also exlained to consist in the plant being kept immersed in fresh vater within a shallow tank, in bundles in tiers. In eight ays it decomposed, and the lowest bundle being the first to ecompose, was first withdrawn, beaten out on a stone or lank, then taken to another tank, cleansed, dried, and combd. Steeping it in brackish water, the plant required twelve ays to decompose.

In the subsequent month of September, as desired, the laster Attendant of Balasore sent round to the Board two aunds of the cleansed Moorgavie, accompanied by two usters of cloth manufactured at Balasore from the flax. he latter had been woven from threads spun by the hand y fishermen, which consequently were irregular, as also the xture of the cloth manufactured from them. In the comunication forwarding these, Mr. Bond stated, that steeping e plant spoiled the colour and appearance of the flax, and endered it less durable.

The second supply of the hemp furnished by Mr. Bond, was forwarded by the Board to the Master Attendant for experiment and report; the samples of cloth were also sent to that officer to ascertain whether it could not be substituted for duck for light sails, or in any way brought into use as a measure of economy.

No reply or report appears to have been yet received from the Master Attendant to the above letter.

In December 1839, Mr. Bond forwarded a piece of cloth manufactured by him from a species of the aloe plant, with a leaf of the plant, and stated, that it was manufactured without being spun, and reported the plan by which it was done. He also sent some thread, produced from the leaf in question.

Upon this, the Board caused a letter to be written to Mr. Bond, thanking him for his continued exertions in the matter, and intimated to him, that the quantity of Moorgavie sent by him in September 1839, was being made into rope and tried with other descriptions of cordage, and that the result would be communicated to him. The Board also requested Mr. Bond to send a similar quantity to that of the Moorgavie, of the samples of the cloth, &c. in order that it might be tried.

No reply appears to have been received to the above communication, and here the matter ended.

A. Irvine.

Fort William, the 12th March, 1844. *Acting Superintendent.*

Extracts from a Work in preparation on the Hill Tribes bordering on the N. E. Frontier, shewing the rude method of manufacturing Salt as practised amongst the Nagas. *By* JOHN OWEN, ESQ.

To the Secretary of the Agricultural Society.

DEAR SIR,—If you think the accompanying extracts are likely to be of any interest to the Members of the Agricultural Society, I would beg the favor of your submitting them at the next general Meeting. I am, &c.

JOHN OWEN.

May, 1844.

The boundaries of the salt manufacturing Nagas are the Singphoes to the N. E.; the Abor Deo Purbut, (or Devil's Hill,) to the S. E.; the plains of Assam and Desang river west; and the Bukloop rapid S. W. The tribes included in this area are again surrounded by other Nagas, who in their social state, approximate more to the denizens of their forests than to the genus *homo*. Each clan is governed by an independent *koonbow*, or chieftain, who usually gains that position by success of arms, although in some instances hereditary. The Namsangeeas, with their neighbours the Bor Dwariahs, or in their own language respectively recognized as Kanjangiahs and Takumeeahs, have on their hills several brine springs, from which they themselves manufacture salt by evaporation, and the process being rather a novel one, may not be uninteresting to those who have not had opportunities of learning aught respecting these strange races.

As in all uncivilized nations, the inhabitants are unwilling to exchange any new system of manufacture introduced by foreigners, however much, such new system might be productive of good to themselves, so it is in this instance, for more than one party has made every effort to convince them, that their present mode of manufacture is an erroneous one, compared with the better plan of using iron vessels. They are

entirely dependent on this article for their livelihood, which when prepared; they carry down to the plains of Assam, and barter it for rice and opium. A perfect satisfaction of interchange I have always remarked; and as they are far from a wish to try any new experiments, either in manufacture or mode of disposal, no strenuous effort has been made by the officers of Government to compel it.

Including a few wells in the Pannee Dwariah chief's possessions, no less than eighty-five have been ascertained to exist, either producing, or which may be made to produce salt. Our Government are supposed to have an interest in four of the Namsang wells; three undoubtedly belong entirely to it, and in the other one, we have a claim of eight per cent., or eight *hâls* out of the hundred. A *hâl* is a flue in which the brine is boiled for evaporation, capable of holding in some instances from thirty to forty *chungahs*, or joints of bamboo, in which the brine rests during the process of evaporation.

In the Bor Dwariah possessions, the Government is entitled to work two out of seventeen *hâls* in one well during the night, and two out of twenty-seven during the day time in another.

The Pannee Dwariahs are not so fortunate in their natural productions, particularly in brine springs, and an interest in one well is all the Company lay claim to, from which they work one *hâl* out of twenty during the night.

The positions of these wells are perhaps remarkable, being generally found in the beds of rapids, and hence only available for manufacture in the cold season, or in the absence of inundation.

It is not unusual for the Assam pikes to go up to the hills and manufacture for themselves; when this is the case, they usually carry up for satisfaction to the Naga proprietor, some rice, fowls, tamul, &c., and pay to the chieftain a proportionate quantity of their produce realized.

The wells being natural, vary in size, some being very deep, and producing more or less brine, averaging from $2\frac{1}{2}$ to 3 feet in diameter, and the shaft is not unfrequently protected with a lining of wood or hollow tree; a common bamboo *chungah* does duty as a bucket, when attached to a stick or piece of rattan.

The place of manufacture is generally selected at a convenient distance between jungle and the well, so as to be near to fuel for feeding the furnace. The *hâl* is of mud work, sometimes 16 or 18 feet long, from 3 to 4 broad; perhaps 3 feet in height, with sufficient space all up the centre to form a flue, and admit these *chungahs* or joints of bamboo to rest on it. This *hâl* in some instances is covered with a grass thatch, and has generally an adjoining hut elevated on poles, used as a sleeping place for those parties who come to manufacture; the elevation of such a place being evidently necessary from the forests abounding in wild animals of all descriptions. The fire being lighted at one end, the *chungahs* are placed close together on the top at right angles to the building, which are filled and constantly replenished with brine as evaporation takes place. Considerable imposition is now being practised, which was not formerly the case, and which will in all probability continue to grow as these tribes advance in civilization, by introducing impurities into the article, such as ashes or sand, which when offered for sale, tells of itself in weight. This must necessarily be the upper surface of the article, the salt having settled at the bottom, which is of the most delicate white colour; it is supposed to contain a large portion of saltpetre, and for domestic purposes, it is objected to. The Professor of Chemistry here has received, I believe, specimens for analysis, and it might be desirable to inquire into its chemical properties.

Taken in a political point of view, it would appear highly necessary for Government to retain both their own, as well as their interest in other wells, as it affords the means of keeping up a communication and preserving (as neighbours)

tranquillity amongst them. Such I have reason to believe was done until an attack from the tribes eastward of them induced the chieftains to claim protection from us, which was promised on their binding themselves over to refer all disputes to a British court for arbitration. The Commissioner of the province has since then made over to them not only the wells, but has ceased enforcing a duty which had hitherto been levied on all salt sold in the plains, a custom which had for many years prevailed, and was in the first instance demanded by one of the Assamese Rajahs.

The Sugar Planter's Companion.

BY L. WRAY.

[Continued from page 236, of volume II.]

On the Manufacture of Sugar, embracing the use of alkalies, evaporation, concentration, granulation, &c. &c. &c.

Juice in this, its most perfect state, is, as a matter of course, more easily converted into sugar of a good quality, than any other. Yet, containing this one obnoxious body, it causes much annoyance to the planter, and has given rise to numerous experiments, in order to get rid of it by precipitation, &c. &c. I can, however, scarcely conceive a more variable article than cane juice; the least difference, either in soil, climate, or seasons, or mode of culture, causes a very perceptible difference; and in some cases, a most remarkable change takes place in the number and quality of the bodies contained in it.

I have known two fields lying immediately adjacent to each other, or to come still more near, two parts of the same field, to produce canes yielding juice quite opposite to each other; the one taking little "*temper*," (alkali,) boiling cleanly and quickly, and producing a fine, fair and strong-grained sugar; whilst the *other* would require abundance

of "*temper*," clarify with difficulty, boil dirty by throwing up quantities of scum, froth and large bubbles, and finally *give but a small amount of dark colored, soft-grained sugar. So much is the cane influenced in its juice, that it requires continual observation and much experience, to enable the planter to judge with any approach to correctness, what* the quantity and quality of his out-turn may be. To refresh the memory, and as a reference at any moment, it is usual on West Indian estates to keep in the *boiling-house*, a book, designated the "*Boiling-house book*," in which is entered all the minutiæ of each day's juice received and manufactured therein, as will be shewn in its place.

The great variance that exists in the several accounts of the different writers on this subject, can therefore be easily accounted for, and no doubt that each analysis given, is perfectly correct; for if each field on the same estate differs so greatly in its juice, from its fellows, what can we expect from *that*, derived from different parts of the world? We may reasonably allow even a *greater* difference in such case, which will serve to reconcile all the conflicting opinions we have received. The grand "object" with the planter is, as I before remarked, to secure to himself the *whole* of the crystallizable matter contained in his juice, or at least as *large a portion* as possible, and to have it of as fair a colour and as free from molasses as he can. We will now follow the expressed juice, from the "mill-house" into the "boiling-house," where it is received into the "cold receivers," and next into the "syphons" or "clarifiers."

Here the juice is treated with very finely sieved "temper lime,"* as soon as the clarifier is full and warm; and fire

* In Jamaica, always the best quality stone lime. Sometimes imported from Bristol, but more commonly burnt on the property from the limestone rocks with which the island abounds.

is kept up, just sufficient to separate the feculent parts, and *raise them to the top in the form of scum. The temperature most suitable to this end is 200° Fahrenheit, but on no account must it be allowed to exceed 210° Fahrenheit.* A practised and careful hand is always required at the clarifier, whose duty it is to apply heat and temper, and keep every thing appertaining to his department, clean and sweet.

The application of temper is generally regulated by the "syphon-man," in conjunction with, and at the suggestion of, the "head boilerman," who is always an old and very experienced person. As the "tempering" of the juice is *of such great importance in the manufacture of sugar,* we cannot do better than give every attention to the peculiarities attendant on its application, and pay due respect to the opinions of experienced authors. *Sacchrometers* and *hydraulic balances* are excellent guides to an inexperienced planter, as by their means he obtains a tolerable knowledge of the richness of the juices flowing into his clarifiers, and also cannot go far wrong in the quantity of temper to be used.

Experience obviates the necessity for such instruments; the taste, look and smell, of the *attempered* juice, fully satisfy the West Indian planter, as also the negro boilermen; and I can safely say, that I never saw such things used in any Jamaica boiling-houses. *Here,* however, they will doubtless prove of very great advantage, and in a measure supply the place of experience.

The very variable nature of cane juice naturally creates a corresponding difference in the mode of treatment, and the quantity of alkali required to promote its clarification.

I have known 3½ lbs. of temper lime taken to clarify a vessel not holding more than 350 gallons of juice, and at other times I have known ¾ of a lb. answer well. The annexed form of boiling-house book and week's work, will suffice to

(Say) *Boiling-house-book of Hope Estate, for* 1844.

JAMAICA.

Days of Week.	Date.	Galls. juice from Mill-house.	Temper lime used.	Galls. juice to the Hogshead.	Skip's Struck.	No. Hogs. Potted.	Used on Estate.	Hogs. on Estate.	Hogs. sent to Wharf.	Total made hogs.	Names of Fields Cutting.	Remarks.
	1844. June		Per 300 Gallons.	Tons Hogs.		Tons.						
Sunday, ...	20th,	...	...	...	...	...	...	...	...	...	...	Day of rest.
Monday, ...	21st,	3,750	¾ lbs.	1,875	12	2	According as it may happen to be.				Fairlie.	1st Rattoons, Cloudy.
Tuesday, ...	22nd,	4,500	¾ lbs.	1,809	15	2½					Fairlie.	Ditto ditto, Rain.
Wednesday, ...	23rd,	4 520	2½ lbs.	2,582	10½	1¾	...	...	...	...	Barbican.	Plants, ... Fine day.
Thursday, ...	24th,	4,500	2½ lbs.	2,571	10½	1¾	...	...	...	...	Barbican.	Ditto, ... Ditto ditto.
Friday, ...	25th,	4,500	2¾ lbs.	3,000	9	1½	...	...	...	...	Cocoanut.	Plants, ... Very hot.
Saturday, ...	26th,	4,500	2¾ lbs.	3,000	9	1½	...	...	...	...	Cocoanut.	Plants, ... Cloudy rain.
Total this Week.	...	26,270	...	...	66	11	...	...	...	...		Total 11 Hogs. made this Week.

convey a very tolerable idea of this fact; however a person who has only recently entered on "the planting line," will do well to test his juice in a white bottle, or a decanter. Even a tumbler will do. There are many ways of doing this; amongst the rest *Fitzmaurice* has the following: "The true and correct mode of ascertaining the due proportion of alkali to any quantity of cane juice, will be as follows. First ascertain the weight of the alkali with precision; scales and weights ought to be kept in the boiling house for that purpose; fill a quart decanter with cane juice, take about half a grain at first of alkali, and continue adding a grain at a time, until you perceive the impurities of the cane begin to separate from the liquor, and continue adding till every particle is disengaged and precipitates to the bottom of the decanter, the liquor then will appear as clear Madeira wine, if properly tempered; it will take three-quarters of an hour to ascertain, and the proportion of temper for the clarifying copper, and the whole crop will then be, as grains of alkali are to one quart in this trial, so many ounces will be the standard for every hundred gallons. If this is well attended to, the sugar will be of a strong white quality, containing all the essential salts of the cane, and consequently possess all its laxative virtue, which the jaggery-made sugar is deficient of."

I have often seen this plan tried with every success, but the worst of it is, the necessity of trying it over and over, to see that no alteration takes place in the nature and requirements of the juice. It is very simple, and can always be tried, which is a very great recommendation.

Dutrone treats on the subject of separating the feculencies, and thereby clarifying the cane juice at great length, and with excellent judgment; but he is so diffuse in the explanation of his ideas, that we can only afford space for a few brief extracts.

"Heat (he says) in the first moderate ebullition, acts particularly upon the first kind of feculencies, which it separates

easily and rises to the surface of the fluid, whence they are *removed by the scummer.*"

"*The second sort require a strong ebullition to separate* them. It often happens, especially when the expressed juice is of very good quality, that heat alone suffices to effect *the complete separation of the second kind of feculencies, and although the flakes formed may not always be* sufficiently large to be raised by the scummer, it is enough if they are disunited, because then they will not escape filtration and subsidence. Alkalis are, in this case, happily dispensed with, an advantage which can never be enjoyed in the usual method in which they must be employed, not only to separate the feculencies from the juice, but also to unite them together under the form of a frothy scum, which the scummer may be able to collect and remove with facility. When the feculencies resist heat, it is proper to employ the concomitant action of alkalis. Lime ought always in all circumstances to be preferred, because in separating the feculencies, it takes from them but a comparatively small portion of their mucilage, and when its action does not produce the desired effect, which, however is an extreme case, it should be seconded by that of potass or soda. As the lime in this method has only to assist the action of heat in separating the feculencies, it never need be used in so great a proportion as in the usual method, when it is also required to give them a frothy consistence to collect them on the scummer. Whatever care, whatever attention is given in removing the feculencies as they gradually rise on the surface, it is impossible to get rid of them entirely by the scummer alone; this is not only insufficient for the feculencies, but it can do nothing for the earthy matters which are accidentally mixed with the juice."

Dutrone here advises filtration and subsidence, which is by far too tedious a process to permit of my recommending it. He gives us to understand, however, that it has been ried by various parties with the very best results.

In another place Dutrone writes: "As it is highly proper to know the degree of richness of the juice to be manufactured, there should be a sacchrometer to ascertain it from time to time. When all is properly prepared for each operation, and the reservoirs for the expressed juice are filled with a known and fixed quantity, it is made to flow into the first clarifier. The proportion of quick lime, for separating the feculencies, should be immediately ascertained. For this purpose, an hydraulic balance should be used; this was invented by an Englishman, and introduced two or three years ago into St. Domingo, (1789.) This balance, which is very ingenious, serves to shew the quantity of feculencies which exist in the expressed juice, and the quantity of lime necessary to separate them. Although it may not rigorously indicate what is the necessary quantity for the complete clarifying, it is, however, very useful in determining the quantity of lime, which ought to be employed in the first instance. Its use is exceedingly safe, as the proportion of lime which it indicates, is never in excess. The lime thus weighed is put into the juice, with which the first clarifier is filled. That its action may take place at the same time all over the juice, great care is taken to spread it by agitation for a minute or two with the ladle; then it is poured entirly into the boilers, &c. &c."

Bryan Edwards in his excellent work on the West Indies, takes particular notice of the subject of tempering cane juice, and mentions, that many planters were in the habit of allowing one pint of lime to every hundred gallons of juice, which he considered far too much; one-half the quantity being in his opinion a better medium proportion; and he speaks of Mr. Bousie's plan of dissolving it in boiling water, previous to mixing it with the cane juice, as a highly judicious method.

It may here be mentioned, that Mr. Bousie was a very clever enterprising man, who was constantly making various

experiments, and was thereby the means of bringing forward many truly valuable discoveries; but which were allowed; (from want of patronage and proper enterprise in his brother colonists,) to remain unheeded and unappreciated. His improvements in sugar boiling were very important, and procured for him a grant of one thousand pounds from the Jamaica House of Assembly. Bryan Edwards records this interesting fact, and also informs us, that Mr. B. was in the habit of using *vegetable alkali*, or ashes of wood calcined as temper, instead of quick lime, until he *became sensible that sugar formed on the basis of fixed alkaline salts, never stands the sea, unless earth is joined with the salts.* B. Edwards remarks: "That such earth as approaches nearest to that which is the basis of *alum*, would perhaps be most proper." Porter also has not failed to enter on this important subject with his usual perspicuity, and although he follows with too much respect the assumptions and arguments of Dr. Dutrone, to be in any way original, yet the ability with which he strives to explain certain passages, and support his authority through thick and thin, shews him to be an able writer, and earnest in his own belief. Dutrone declares, that no acid can be discovered in cane juice in its unaltered state, and supports his opinion by that of others.* Porter on this, takes up the theme, and treats it in a manner very foreign to his usual custom; for he commences by fixing on every one, (save Dutrone and himself,) the charge of believing firmly in the existence of an ACID in cane juice, and thereupon proceeds to ridicule the supposed established belief, much to his own contentment.

* M. M. Darcet and Maquer made various experiments in 1782 at Berci, on juice of the cane, which M. Boucherie had caused to be conveyed from Malaga, but they were unable to detect the presence of an acid. We have made a great number of experiments in St. Domingo upon the juice of the cane, and are convinced, that none gave the smallest evidence of the presence of an acid. —*Dutrone.*

He says, "This acid was regarded as a formidable enemy, and unremitting attention was bestowed in combating it. One only cause was assigned for all the mischances which arose, and it was thought that there existed only one means of destroying it; and hence all efforts at improvement were circumscribed to seeking out this antidote. Some believed that they had discovered it in quick lime, others in potass, others in soda, whilst some more minute in their researches, thought they had found it in the ashes of some plants, or in certain neutral salts, such as alum, &c. &c." And then he, (Porter,) instances the experiments of Mr. Bousie, who most certainly had not that object in view, but rather the discovery of an alkali, which would possess greater power in separating and precipitating the *feculencies* contained, without causing the injury that quick lime does.

From the numerous experiments made by this very clever and persevering gentleman, he was as well aware of the bodies contained in cane juice as any person of the present day, and B. Edwards himself particularly mentions the fact of Mr. B.'s having made very excellent sugar from good rich cane juice, without using one particle of temper. In another place, Mr. Porter gives a very succinct and correct account of the method to be pursued in tempering and clarifying cane liquor in the clarifiers, but as it is almost entirely gleaned from the directions of Dutrone and Fitzmaurice, it need not be repeated here.

The common plan that I have been accustomed to in the West Indies, I will now briefly explain. The temper being applied to the juice in the clarifier, and the fire kept up to create a temperature of from 200° to 210°. Fahr. (as before stated,) the liquor is allowed from 25 to 35 minutes, (or perhaps even 40 minutes,) to "*yaw*" or clarify, by which time the surface will be covered with a thick crust of scum, which gradually begins to crack across in a variety of places, and discovers a small white froth, working up through each crack, also all round the sides of the vessel.

This well-known sign, satisfies the syphon-man, that the time has arrived to withdraw all the fire from under the clarifier, which is accordingly done, and if in no great hurry, a quarter of an hour or twenty minutes *more* is allowed, to admit of all the particles that may still be floating, being precipitated.

It is then drawn down by a syphon, or through a cock into the 1st evaporator or grand copper, taking great care that none of the sediment at the bottom of the vessel passes through; a good stout blanket, doubled, performing the office of a strainer very well. The small quantity remaining at the bottom of the clarifier, with all the sediment and dirt, is then run off into the "skimmings gutter," and together with the water employed in washing out and cleansing it, finds its way into the "*skimmings receiver*" in the "*still-house*," and is used in making rum, as will be further explained, as we proceed.

If the juice is good, and it has been well tempered, it will now be beautifully transparent, and of a very pale sherry colour. In the grand copper, it is subjected to a greater degree of heat than before, and is gradually brought to the boiling point.

From this, it passes (through a strainer) into the 3rd copper or 2nd evaporator, and receives a still greater degree of heat. But during its continuance in these two evaporators, should the boiler-men think a little more temper necessary, lime water is added by degrees, until it throws up its remaining feculencies in the form of scum, or has assumed the appearance which the head boiler-man considers most desirable. As soon as the cane juice is clarified, it is termed *cane liquor*, and continues to bear that name until it reaches the second tache, when it assumes the name of syrup; it also passes through fine strainers on its way to the second tache, so as to free it from any impurity that might have escaped through the others. A boiler-man is stationed at

each boiler, (making four men to each set,) whose duty it is constantly and carefully to scum off all the scum that rises, and pass the liquor from the one boiler to the other. The two first boilers are termed " *evaporators*," from the circumstance of the water in combination being chiefly evaporated in them; the third boiler is named the second (or preparing) tache, from its converting the liquor it receives into syrup, all ready prepared for the concentrating tache, in which latter it is concentrated to the degree necessary to convert it into sugar.

When the liquor in the second tache assumes the consistency of syrup, the boiler-man attending on that boiler, must dip in his ladle and then holding it up empty, mark the manner in which the syrup drains off it; if it falls short, in drops, sufficient temper is supposed to be present; but if it is perceived to be ropy or stringy, and falls with long extended threads hanging, it is deemed wanting in temper, and a little more temper lime water may be added, mixed with the liquor of the second evaporator. When the syrup reaches the tache, this test becomes more apparent, and the fact can then be more correctly ascertained, especially by a person, who has not had the benefit of much experience.

All this being satisfactorily performed, the concentration of the syrup into sugar proceeds to the desired point, carefully attended to, and watched over by the head boiler-man. Ever and anon he raises the ladle, bottom up, and notes the appearance of the syrup as it cools, and at length when after repeated trials he observes the *grain* to form, (on the back of the ladle,) white and large,* he immediately orders the fire to be damped, and takes off the " *skip*" with all possible expedition.

* This which is usually termed the grain on the ladle, is in reality nothing more than numerous small white bubbles very close together, and deceptive in appearance.

Whilst doing so, it is customary for one of the other boiler-men, who is disengaged, to add a couple of ladles-ful from the second tache, to prevent the sugar being over-boiled and burnt during the operation of "*skipping*," which from the great heat of the tache, is otherwise very likely to occur.

There are other tests, to shew when the syrup has arrived at its proper degree of concentration. Some try it by the touch, which consists in taking a little off the back of the ladle with the fore-finger, then touching it with the thumb to see if it will draw out into threads like tar, which is a proof that it requires more boiling; but if the thread will not extend more than from ½ to one inch, without breaking off crisp, the boiling may be considered finished, and the sooner it is out of the tache, the better. Some persons drop one or two drops on a piece of clear glass, and then exposing it in the open air, observe how it assumes the grain,* but this plan appears to me to occupy too much time, during which the contents of the tache are liable to be over-boiled and burnt; for every old planter knows, that even one minute will very often serve to effect a deal of injury to the sugar. Too much time is indeed lost, very often, in *skipping*† the sugar alone, from the moment it has become properly concentrated; the delay of an instant cannot be allowed, not a moment is to be lost in skipping it off, therefore it is of particular importance to have at command as expeditious a test as possible

* Porter, page 85.

† Great care and expedition in striking (*skipping*) are required, to lessen the injury from burning, an evil which is necessarily operating from the moment the syrup reaches the striking tache, and increases progressively as its concentration leaves a larger portion of the surface of the vessel exposed unprotected to the direct action of the fire. It has been constantly observed, that each successive ladleful of sugar which enters the cooler, is darker in colour, and consequently worse in quality; and so excessive is the degree of heat employed, that if the tache is not immediately replenished it becomes red hot, to the manifest injury of the vessel itself, as well as of the syrup next transferred to it.—*Porter.*

Experience soon teaches this, and indeed in India the natives are pretty correct in their knowledge of the exact time. I have often watched them in their own "*kerkannas*," (manufacturing houses,) and been witness to the nicety of their judgment in this respect.

As the sugar is discharged from the tache, it should run through a gutter into the "*coolers*," which as I have before noticed, are large, shallow, wooden vessels purposely constructed to receive the hot sugar from the tache, until it granulates and becomes sufficiently cool for potting, (*see page* 180, vol. II.) They should always be situated very near the concentrating taches, as shewn in ground plan of boiling-house, (plate 2, vol. II.) which is as excellent a situation as I can recommend.

As soon as the "*skip*," enters the cooler, the head boilerman stirs it up well for the space of a minute or so, with a long wooden spatula, in order that the whole may be alike; he then leaves it for the space of about an hour, when a thin crust will have formed on the surface; this he breaks, and once more gently stirs up the whole again, after which he lets it remain until sufficiently cool and consistent throughout to admit of another skip being delivered on it. Two successive skips should never be put in one cooler, unless some very strong reason urges, such as when the first skip is much over-boiled, and it becomes advisable to add the succeeding one to it before it has time to cool and become too hard. In this case, the second skip is purposely boiled low and struck in that condition to counteract the effect of the over-boiling in the first. The usual plan, and indeed the proper one, is to mix every third or fourth skip, by which each cooler gets a skip in rotation until they are all quite full. A cooler in Jamaica is made to contain six skips, which exactly fill one hogshead of from 1800lbs. to one ton weight. As soon as the full cooler becomes sufficiently cool to allow of the finger being put into the

sugar without pain, it is ready for potting, and pails are put in requisition to transfer its contents to the "*curing-house*," where it is placed either in hogsheads, barrels, cases, boxes, cones, or nauds, and there left to drain itself of its molasses. In Jamaica, we use the two former, but in this country, nauds, cones, and cases are more in request. For my own part, I like cases of the form and size recommended by Dutrone, and from what I have seen of them, think that they answer the purpose remarkably well, although I cannot discover the least necessity for their being sheeted with lead inside, and am quite convinced that to do so, is only to incur a heavy and uncalled-for expense. Our hogsheads, barrels and boxes are never metalled in the West Indies, yet they cure sugar as well as, if not better than any other form or description of vessel in the world. However, to explain the form and size of these cases, I will quote the description as given by Porter. "Dutrone found by experiment and experience, that the quantity of matter which unites the most favourable number of circumstances for crystallizing the essential salt of the cane juice, is from 15 to 16 cubic feet; and it was from this knowledge that he regulated the form and dimensions of the cases about to be described. He made many trials of cases differently shaped at bottom, and he arrived at the conclusion, that those upon which he ultimately fixed, are most effective and convenient.

The crystallizing case ought to be five feet long and three wide. Its bottom is formed of two planes inclined six inches, the meeting of which forms a channel, and which is the central line of the greatest dimensions; there are in this channel, twelve or fifteen holes of an inch in diameter, for the syrup to drain through; the depth of the case is nine inches at the sides, increasing towards the channel where it is fifteen inches. This case ought to be made of planks of wood of an inch thick, and lined with very thin sheets of lead. It is better before lining the case, to pierce the holes of the

channel, and to burn the inner circumference of these holes with a ball of hot iron, in such a manner that there should be a slight concavity in the middle of each; by this disposition, not a drop of syrup should remain in the cases after curing. The holes are bound with tinned copper rings soldered inside to the lining, and folded down outside and nailed to the bottom. The case thus made and lined with care, offers every possible advantage for crystallizing and draining."

Made up-the-country, cases of this kind could be procured at from 3 to 4 rupees each, of good, strong and well-seasoned wood, which would last for many years without injury. Of course I do not mean metalled cases, as I before gave it as my opinion, that they do not by any means require such addition.

They are very simple in their construction, which renders them very suitable to this country, as any common native carpenter can mend or make them, and their small size and weight renders them extremely handy for arrangement in the curing house, or removal from one place to another.

In Native curing-houses, nauds are mostly used, but they also, not unfrequently, have large draining receivers, made of clay and chopped straw, well worked up, and allowed to harden; the inside is made quite smooth, and then well plastered or "*leepowed*," with a composition, consisting I believe, of cow-dung, lime and clay, which prevents leakage.

The usual size is 3 feet wide, 3 feet deep, and 8 feet long, although some exceed this, and others again are not near so large: I have often seen them myself, and found the sugar drained in them of very good quality, and pretty free of molasses. They certainly did seem to me to answer the purpose very well indeed, although the novelty of the thing, together with the rudeness of the materials used, impressed me with no very favourable idea of them at first sight.

Having now carried my readers as far as the "curing-house department," in order to give them a plain, straight, and un-

interrupted account of the process, that I myself have been accustomed to, we must return to the "boiling-house," and give a little further consideration to the several means proposed for the more perfect clarification of the cane juice and cane liquor, as it passes through the "*boilers.*"

It has been an oft-repeated saying, that "*perfectly white and pure sugar can be obtained at one boiling, from the cane juice, even in open pans.*" Indeed I have heard it more than once asserted, that certain Frenchmen had been fortunate enough to succeed in so doing, and were about making their fortunes; yet like many other such wonderful inventions, it seems to have passed away; but whether the pleasing vision was too ethereal or too expensive to be entertained, remains yet to be discovered. My own idea is entirely against the probability, when made in common open pans; but when decolorised syrup is boiled in vacuo, I think that white sugar may be obtained at once, without the aid of clay, river weed, (*sewah,*) alcohol, or other substance, commonly used in these cases.

By the application of these auxiliaries, sugar boiled in open pans, can always be whitened, but that is not the point, it is to produce a sugar that requires no such assistance, but which shall leave the concentrating tache in the form of white syrup, and shall granulate and drain off in the cones or cases, and become a fine, white, well crystallized sugar. The process by which I believe this may be attained, is as follows:—

The cane juice is tempered and treated in the manner before laid down, whilst in the clarifiers, from which it is drawn down through very fine strainers and thick woollen cloths, many times doubled, into a second range of clarifiers, or precipitators, hung over separate fires. Here the liquor may be subjected to a temperature of from 210° up to 215° Fahr. for some little time, whilst an attendant watches, scummer in hand, to skim off any froth or scum that may

rise to the surface. When no more is thrown up, and the liquor looks clear and fine, throw in gradually and stir up well a small quantity of ley, composed of alum and lime water mixed, and continue adding little and little by degrees, until the ley produces its effect on the liquor, by disuniting and separating the second and more *gummy* feculencies, which will then appear in the form of thin flakes, shewing a disposition to precipitate. Matters being arrived at this desirable point, the fire should immediately be withdrawn, and the liquor allowed time to precipitate all these flakes of fecula. This will take a long time to do; two hours, or the very least one hour and half must be allowed for this purpose, after which, it may be drawn down very gradually and carefully through a woollen strainer, into the 1*st* evaporator, so that what feculencies escape precipitation are arrested in the strainer, and the liquor passes clear.

However successful this second purification may be, yet we can never expect to separate and get rid of the whole of this most troublesome and obstinate body, for it enters so intimately into combination with the crystallizable portion of the juice, as to make it next to an impossibility entirely to separate and get rid of it *alone.*

This is rendered yet more difficult, when an *excess* of temper has been used in the first clarification, inasmuch as it acts prejudicially on the mucilage contained, and also *hinders* the separation of the gummy fecula, by holding it in solution : where this occurs to any extent, the application of very diluted sulphuric acid is advisable. Other acids answer as well; but in the application of *any* of them, great care must be taken, or much mischief may be done. A person should have some knowledge of their use and properties, to use them beneficially and safely.

The liquor being now supposed to be in the 1st evaporator, after having undergone two distinct separations of two distinct kinds of fecula, may have most probably obtained an

extra shade of color; and it now undergoes the regular process of boiling, scumming and transmission from one boiler to another, until it begins to assume the character of very thin syrup, when it leaves the boilers, and is received into appropriate vessels, where it is treated with a composition of animal charcoal powder and other materials, and kept well stirred about for a short time. Half an hour is then allowed for subsidence, after which it is drawn off through strainers, and passed through "*animal charcoal filters,*" when it will entirely lose its colour, and appear perfectly white and clear. It is now to be boiled to concentration "*in vacuo,*" in order to prevent its receiving any color by burning, or that frying at the sides which is constantly going on in open boiling pans; and the result will be, *well grained, sparkling white sugar.* The more simple the vacuum pan, the more suitable to our requirements, and the more cheap, so much the more welcome, especially to those who cannot afford their 20 or 30,000 rupees, for the costly "vacuum pan" of "*Howard.*"

This plan presents many objections, yet it is not devoid of merit, nor wanting of good points to recommend it; I will therefore review it in as brief a space as possible, before I pass on to other matter.

To boil sugar on this plan, the boiling house would, in the first place, require an extra set of sheet-iron clarifiers or precipitators, each hung over a separate furnace of its own, with at least one attendant to each pan. Next, it would require a range of mixing or refining cisterns, which might well be constructed of good hard, well-seasoned wood, as teak, cedar, saul or pitch pine, which would not need any metallic lining. In these cisterns, the thin syrup would be mixed with the refining composition, and prepared for the *filters,* which would be another addition required, although a very simple and cheap one. Next and lastly, it would be necessary to have a vacuum pan of the most simple form possible, and

very moderate in price; or instead of which, Messrs. *Beale* and Porter's very excellent concentrating apparatus,* which is really such a combination of efficiency, simplicity, and cheapness, that I only wonder it has not received the notice it deserves. Mr. J. T. Beale, (of Greenwich,) has often conversed with me on its merits, and assured me, that it had been adopted by some very intelligent planters in the West Indies, who had found it to answer so well, that they expressed themselves greatly delighted with its performance. Knowinghim to be possessed of too sterling a character to allow of his "*puffing*" any of his inventions, I am the more desirous to bring before my brother planters this very simple apparatus, especially as I am certain very few have ever seen, or perhaps heard of it. *Porter*, describing this invention, says;—" Mr. J. T. Beale, and Mr. G. R. Porter, obtained a patent for the invention of a new mode of communicating heat, which is applicable to a great variety of purposes; but to none can it be rendered more advantageous, than to the manufacture of sugar from cane juice. This invention affords the means of regulating and controlling degrees of heat with the most absolute precision. This desirable object is attained by transmitting the caloric to the syrup, through the intervention of certain fluid substances, which, unless they are purposely subjected to pressure in close vessels, can never be made to indicate beyond certain degrees of temperature; so that the degree of heat best adapted to any particular operation being known, a fluid medium may be chosen and applied, which will communicate that degree and no more. It will be seen that this plan embraces every advantage that can result from the use of high-pressure steam, and that at the same time, all the danger, complication, and liability to derangement, attendant upon steam heating, are avoided. The absence of all elastic pressure tending to rupture the vessel is proved by keeping up

* See Porter's Work, pages 193, 4, 5 and 6.

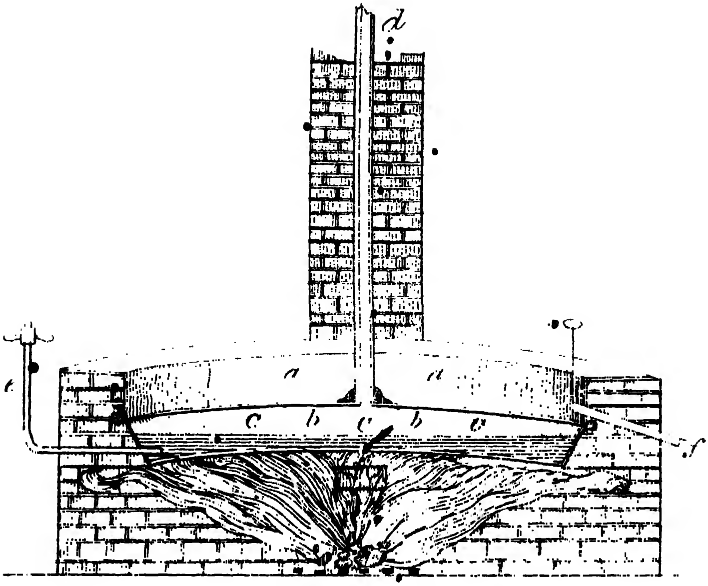
a constant communication, (as will be hereafter explained,) between the fluid medium and the atmosphere. The maximum degree of heat being, by this arrangement, altogether independent of accident, or want of skill in the attendant, no injury from burning can possibly take place, unless through the choice of an improper fluid medium, which need never occur, as substances may be chosen capable of communicating any given temperature between the boiling point of water, or even lower, and the melting point of lead.

"The arrangement for employing this method of heating can be best explained by a reference to the annexed diagram.

"It will be seen that this is a compound vessel, the upper part (a a) forming the evaporator or tache, and the lower part (b b.) containing the fluid medium (c c c), indicated by the shading. The exact depth of this fluid is no further material than as it is necessary perfectly to cover, and thus to protect from the injurious action of the fire, the bottom of the vessel. This bottom is, for the purpose of imparting strength, made slightly concave, and a similar form is given to the bottom of the upper vessel, in order that the syrup or sugar may flow off more readily through the sluice cock (f); the small tube (e) is inserted near the bottom of the lower vessel, for the purpose of supplying the fluid medium, and may be furnished with a cock at its lower part, where it enters the brick work, to draw off the liquid again, if necessary. The tube (d) which rises from the centre, is open at both ends; the lower extremity is carried through the upper surface of the lower vessel; it is then made to pass through a condensing vessel, charged with water, and its upper end opens to the air. The use of this tube, or breathing pipe, is to allow, in the first place, the escape of the atmospheric air contained in the vessel (b b), which air being specifically higher than the vapours furnished by the fluid media, will of course be driven off so soon as these are made to boil.

"This breathing pipe serves likewise to demonstrate the entire absence of all elastic force in the vapours of the fluids employed for heating, and stands in the place of a safety valve. The fluid medium, from its small capacity for heat, is very speedily made to boil, when the vapour which it gives off, is brought into contact with the bottom of the copper or tache, which being colder than the vapour, this is immediately condensed, and returns in the fluid form to the bottom of the vessel (b b), to be again continually vapourized and condensed as before.

"In resuming the liquid state, it is necessarily made to part with that portion of its heat to which its vaporous form was owing, and this occasions the heating of the contents of the vessel (a a). The tube (d), in addition to the uses already mentioned, would serve in conjunction with the condensing vessel with which it is connected, to condense and return any of the vaporised medium which may have escaped condensation by the contents of the copper (a a); so that, except from very gross negligence, little or no loss of the fluid will be sustained. The first cost of the fluid agent is very moderate, and to supply the waste of a whole season, could not entail an expence beyond a very few pounds. This invention has been put to use in the West Indies, and has been pronounced by a very intelligent practical planter, to answer *every end proposed by it*, and to be "*a very great improvement generally.*" Hitherto its use has been limited to the striking tache, which has been hung to a separate fire. The annexed plan will shew the arrangement of the furnace and flues which are thus disposed, in order to insure an equal distribution of the flame over the entire surface, the apertures being so calculated, that the rarified air cannot all pass through the entrance to the chimney, and a part must be drawn through the side flues in the direction indicated by the arrows.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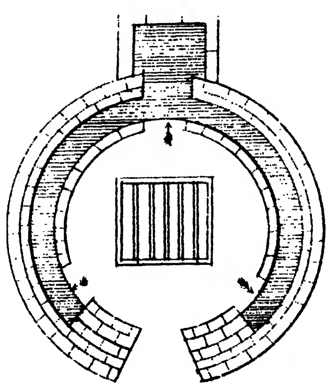


with the celebrated vacuum apparatus invented by Mr. Howard, and with a degree of simplicity which renders it attainable by the sugar planter, which cannot be said of the very scientific, but complicated apparatus of Mr. Howard. It is well worthy of consideration and trial, whether Mr. Kneller's patent used in conjunction with that of Messrs. Beale and Porter, would not effect all the improvement of which the process of sugar-boiling is susceptible, by preventing all possibility of burning, and by abridging the time during which cane liquor must be subjected to the action of heat. (*Porter*). Nothing can be more simple than this blowing apparatus, and nothing more easy than to fix it on the boiling pan; the expence of material and construction is very trifling, and in a country like this, where the very natives set us an example of economy and simplicity, a plain wooden box, with a number of perforated bamboos fitted into the bottom, would answer the purpose admirably; the only addition necessary being a blowing contrivance connected with the box; whether that be, a bellows, fanner, or what not; and the amount of labour required to work it, which would be very trifling indeed.

I have been particular in giving a full-length account of this joint boiling apparatus, as I think it deserving of notice, and a fair trial; however, my brother planters will be able to judge for themselves.

The number of hands employed in and about a boiling house are pretty numerous; but of course depend on the size of the place, and the quantities manufactured during the year. In a West India boiling house, having a double set of boilers at work, it was usual to allow to each spell (double) the following :—

Viz.	1	Head boiler-man,
	2	Tache-men,
	6	Common boiler-men,
	1	Syphon-man and boy,
	2	Stocker-men.
	12	Dry-trash carriers, and
	6	Potters, when required,
Total	30	Men, Women and Children.

Of these the head boiler-man is considered the chief officer of the department; and he must have performed long and good service

before he could arrive at such an important and responsible appointment. With him chiefly, and next to him the syphon-man, depended the quantity and quality of the estate's out-turn. I have seen a head boiler-man listening, with all the patience imaginable, and with well disguised contempt, to a long medley of directions from the resident European manager, just appointed to the estate, who wanted to shew off his great knowledge of sugar boiling; and then, as he left the boiling house, would give vent to his feelings of scorn, exclaiming, "Poor ting! what him know 'bout boil sugar? Him no know noting 'tall 'bout it; how him for know? But him have right for talk: him no Bussha? him no Buckra?* Him tink say, if him no talk and make noise, nothing da go right in a boiling house. Poor ting, him able for teach me for boil sugar? O Lud!! Let me alone Buckra. Massa, bin send you here for Bussha, but him no tell you say, you for poil all him sugar. Sit down softly in a house Buckra, so make me make good sugar for me Massa; no come bodda me here, me no wantee."

With this gentle expression of sentiment towards the offending Bussha, (but not in his hearing,) things would go on in their usual course until the new manager would see fit to drop such a line of conduct, or by following it up and worrying the boiler-man, cause him to leave his post in the boiling house, and betake himself to other employments. Sensible and experienced planters, however, were generally very averse to any thing like harshness, or unnecessary fault-finding in their treatment of these highly useful and responsible servants. Indeed eyery encouragement was always afforded them, and a certain latitude allowed for the exercise of their own judgment in matters appertaining to their particular department. Roughley's "Jamaica Planters' Guide," (written some 22 years since,) contains some very excellent remarks on

* Meaning is he not Manager! Is he not a White Man!

this subject, which I think will in a great measure continue to be applicable as advice, as long as sugar continues to be made. He says, "The head-boiler should always be an experienced negro in such work. He is chosen by the overseer, (manager,) to follow his direction, and to conduct the critical business. Sometimes there are two ostensible boilers, to spell and relieve one another, but this breeds envy and strife between these jealous-headed people, and often confusion is produced throughout the work.

"It would be better, therefore, to have only *one* principal boiler, make him the responsible person in the boiling house, and when he is obliged to be spelled, for the purpose of taking his natural rest, he should leave his injunctions to a judicious negro, whom he and the overseer can trust and put confidence in, to carry on the work in the boiling house, until he returns. Many of the junior boiler-men are proud and emulous of such an undertaking, and often turn out excellent manufacturers of sugar. It will be well for the overseer not to chide or check the head-boiler much, except a glaring fault occurs in him; he may become dispirited, diffident, and careless by so doing. It often occurs, that this man has a very general knowledge of the method of making good sugar from almost every cane piece on the estate; is conversant with the soils, the management the canes have received, and when the overseer may be in a dilemma, knows how to proceed to correct some perverseness in the cane liquor.

"This useful servant, may by his ready experience, explain the cause, and apply a remedy to prevent its bad consequences. The head boiler and boatswain of the mill are the leading, ostensible, and confidential persons about the works in crop time, while sugar is manufacturing."

In India, as sugar estates become more common throughout the country, native boiler-men will in course of time become equally expert and well versed in the peculiarities attendant

on the manufacture of sugar, not only from different cane fields, but from distinct species of cane, and will learn to distinguish and apply all the little niceties of the art in their practice; whilst their superior intelligence, joined to knowledge derived from experience, will serve to constitute them boiler-men of a very superior class.

Even as things now are, a planter has no difficulty in picking up a very tolerable and smart native boiler-man in any sugar district in India, who although he may not be accustomed to boil cane juice *at once* into syrup or sugar, yet, by being shewn the method in a clear and straight-forward manner, and having every why and wherefore explained to him by an experienced person, is quite capable to perform his duty in a very short period. Time and experience will mature his judgment, and no fear need be entertained as to his overcoming the difficulties that lie in his way from difference of soil, climate, situation, and varieties of cane. All will come round in due course, provided always, that the head boiler-men of East India estates will be *content* to remain any length of time in one employ, so as to understand the nature of each cane piece. I do not see any great reason to doubt this, for we see hundreds, even thousands, of natives of different classes, remaining in the service of one master for a series of years, and obstinately clinging to their old employment, which goes to shew, that they will have no objection to do the same on sugar estates, where they receive kind and considerate treatment.

Nothing can be more injudicious than exchanging your head boiler-man on every trifling occasion. I would wish to impress on my brother planters the force of this caution, and advise them rather to put up with a few annoyances, than by discharging this functionary, to subject themselves to the grievous trouble and vexation of having to begin again with a new hand, to be served perhaps still

worse by him when he has learnt his business, and is becoming useful.

I remember visiting a planter, up-country, who had just commenced working off his crop of canes, and every one being new about the place, and unpractised in such operations, I was much interested to see how the natives would enter on the manufacture, and in what spirit they would receive any advice which might be tendered to them. I waited until they began, but seeing that every thing was going wrong, I addressed myself to the task of rectifying matters, and shewing them how to proceed. In the mill house was the gentleman, (managing), whilst I took the boiling house; here I began with adding the requisite quantity of alkali to the juice, then scumming the coppers, ladling and straining the liquor, making the fire with my own hands, explaining this, and pointing out that, circumstance, as we proceeded, and finally ended, by skipping a charge of sugar. To all my proceedings the (head) native boiler-man paid the most marked attention, listening with great interest to all I said, and frequently putting to me the most shrewd and pertinent questions. The result of this anxiety to learn was very apparent, for the next skip he struck *without my* assistance, and produced a very good, fair sugar, and continued to do so to the end of crop, (as I have been informed.) I must say, that I was not a little surprised and pleased at finding so great a desire to be informed existing in the up-country natives, and the facility with which this man seemed to comprehend every thing I explained to him gave promise of great perfection, had he had the means of instruction at hand, to apply to, when at a loss. The syphon-man ranks *next* in importance to the head boiler-man if we consider the nature of his duties, which requires him to be constant and unremitting in his attention, discriminating and exact in his judgment, and scrupulously clean, careful, and

industrious in his habits. To him appertains the management of the juice from the moment it is expressed until it reaches the grand copper in a clarified state, and all the vessels, gutters, strainers, &c. &c. into and through which the juice passes, he must see kept constantly clean and well limed, to prevent acidity. He must fix the strainers in their places, and pay particular care that they do not become choked with bits of trash, &c. &c., and thereby cause the juice to overflow instead of run through them; he must also put fire to the clarifiers, regulate the degree of heat that is kept up, and damp it when he judges the clarification complete: and lastly, he must carefully sieve very fine, weigh off, and apply to each clarifier, its proper proportion of *temper lime,* according to his judgment and experience. This he mixes with hot liquor, (in a ladle,) to the consistence of thick cream, and then throws it into the raw juice, and stirs it all up together for some time, to make it diffuse itself, equally, throughout.

If *well* tempered, the clarification goes on kindly; if more is required, a little more is added; if too much has been applied, (the juice readily shews it by its colour and caustic smell), a portion of the contents is ladled out into an empty syphon, and fresh juice is substituted to rectify the error; but when very bad juice comes to be dealt with, which puzzles the syphon-man by its obstinacy and perverseness, the advice and assistance of the head boiler-man is sought and obtained, to overcome the difficulty.

When good or ordinary juice, however, is under treatment, the superior knowledge of the head boiler-man is never required, nor does he interfere with the syphon-man, unless he finds the liquor not "*boiling well,*" when he may tell him to be more careful, and add a little more temper to the next charge. But this occasion seldom occurs, provided the syphon-man is what he ought to be.

In India, as in Jamaica, great care should be taken in the selection of these responsible subordinates about the works,

16*th.*—Ploughs at work every where at the rice fields, only one small bullock or buffaloe is used, but although the soil is heavy, and very wet, the furrow turned up is clean, and fully as deep as that by European draught horses. The manures now in use are cow-dung, the coal black deposit from canals, and the liquid composition in its fermented state. In procuring the second of these, many boats may be seen on the canals, with two men in each; the instrument employed resembles a pair of antique snuffers, and is formed by attaching to the extremities of two long bamboos a couple of scoops either of wood or iron, which may be opened or shut at pleasure by connecting the bamboos about their upper third. The fields to which the cow-dung and coal deposit were applied had not been under green crop. Small patches of trefoil are being ploughed in,—the process is as follows: The field is thoroughly ploughed, it is next flooded, and thereafter harrowed with a heavy machine having two rows of horizontal and concave knifes fixed in the cross bars of a substantial frame-work, and to add to the weight the bullock driver stands upon the frame. This harrow is dragged through the field in every direction until the roots and stalks of the plants are effectually cut up, and in a measure incorporated with the soil, in which they soon enter into new elements through the process of decomposition, accelerated by the heat and moisture. Mustard springing into seed, and the flowers of the lupine opened, that of the trefoil scarcely. Wheat, buck, barley, and bean in full ear, and a crop of green vegetables being housed. The rice seed rising above water, and showing its green coat, other rice beds in course of preparation. Fields being reploughed across former ridges, and manured. Mustard in the full seed, and lupine being cut for ploughing in; the trefoil not yet complete. Dun oats on the slopes and summits of hills in a loose, poor and dry soil, the crop short, and altogether inferior, it is now in ear. Beans and peas in the market.

30th.—The rice in the seed beds about two inches high, fields being turned over, and some trefoil cut, and harrowed in as already described. Peas, beans, and cherries in the market. Rice beds still being prepared.

May 7th.—This has been a very busy week, all hands having been employed from dawn till long past sunset, cutting the trefoil and lupine, and harrowing it in; not more than one-third is left to enrich the soil in which it grows, the remaining two-thirds being carried to other fields, from some of which a crop of mustard has been only just removed. Considerable quantities of beans have also been ploughed in without removing the pods, as these have ground in a rich moist soil the stalks are high and the foliage abundant. The weather has been often close and sultry, and the temperature equable; decomposition has been active, and the smell arising from the decomposing vegetables is very strong; many of the fields show the carbonized matter floating on their surface. The transplanting of the rice has commenced; the plants are about six inches in height, they are removed from the seed beds in small bundles, and carried in baskets to the fields; these fields have been finely worked up, smoothed and flooded, after which the plants are set in by the hand in rows about twelve inches apart. Wheat, buckwheat, and bean becoming yellow in the ear, and the mustard pulled up and stocked to dry. Peas and beans becoming too old for the table.

27th May.—The two past weeks actively employed in ploughing and preparing fields, and planting rice; during the last few days a second plantation of rice plants has been put in, previous to which the fields had been weeded, well irrigated, and the soil and water thoroughly stirred up. This process seems equivalent to the hoeing of other crops, and is performed by a flat square piece of wood set with short wooden teeth, and fixed to the end of a long piece of bamboo. The mustard seed has been dried, beaten out, and

winnowed, much bean and barley cut down, dried and beaten out on the field, the straw stocked in preparation for stacking. Beans cut and dried for seed and domestic use. Indian corn raised in beds, and transplanted into ground from which mustard had been removed; this ground had been well ploughed, broken, and set up into beds by three-pronged rakes, and manured from the farm yard. Green peas pass out entirely with this month, and are succeeded at our table by a tolerable good species of French bean.

May.—The highest range of the thermometer has been 80°, the lowest 48°. The greatest range in 24 hours 15°. Upon the whole the temperature and weather have been favorable to vegetation, with rain more than sufficient to keep the canals filled, although not enough to supply the rice fields without drawing upon the stock in the canals.

June 7th.—The whole of the grain crop has been nearly got in, the seed removed from the ear, and the straw stacked. The weather has been particularly favorable for these processes, but the farmers dread the long continued drought, as it may endanger the rice crop, and it requires their utmost exertions, by means of constant irrigation, to keep the soil under water. In taking a survey of the vallies, hundreds of wooden chain pumps* may be seen thus employed, and each worked generally by only one hand—other labourers may be observed stirring up the soil with the water after the manner already described, which is said to have a fertilizing effect, and may also retard evaporation. There is rising a fine crop of cucumbers and melons in the sheltered faces of the hills, in light soil, having a warm southern exposure, and in the low grounds, planted in ridges, are extensive fields of brinjals, a vegetable in much favor.

14*th.*—During the early part of this week, the whole native community became much alarmed at the prospects of the season; rice advanced considerably in price, and a

* Plate vi. fig. 3.

famine seemed impending. The canals were pumped dry, many of the fields beginning to crack, and the plants showing in some places a withered top. With the exception of a slight shower on the 1st instant, there had not been a drop of rain for a fortnight, and the weather being particularly dry and hot, was consequently favorable to evaporation. On the evening of the 10th, there were some electrical phenomena observed, but followed only by a slight shower. Had it not been for the large supply of water in the canals, the rising crop must have long ere this time been completely destroyed; human exertion could not procure water; earnestly therefore did they appeal to their Gods, and often have I seen the aged and experienced anxiously scanning the setting sun for the indications of the blessed shower. The morning of the 11th was calm, close, and sultry, and towards evening there were thunder and lightning, accompanied with heavy rain. For the three following days it rained almost continually; the canals were filled, and the air was for weeks afterwards loaded with moisture, so as to affect very strongly all articles of iron, leather or woollen; vegetation now made rapid strides, and the appearances of the failure which were so threatening, have at this time (25th June) completely passed away.

July.—The whole of this month has been dry, clear weather, and at times very sultry, the nights close and calm; particularly towards morning, with heavy dews, and forming altogether a temperature equable and highly favorable to vegetation. Some rice and vegetables were laid down at its early part upon spots of ground, from which wheat, barley, and mustard had been removed. Many of those, generally the youths of the family, have been employed to keep the rice fields under water, and others weeding them as it becomes necessary; the weeds are pulled up by the hand, thoroughly twisted, and buried at the roots of the plants; the labourer wades along in the mud often on his knees,

having his face protected by a shield made of bamboo twigs; he will continue at this toilsome work from the earliest dawn until long past sunset, that is from five A. M. until about 7 P. M. But the chief occupation has been the care of vegetables and fruits, which are in great abundance all this month. The brinjals of good quality are very extensively cultivated, as are also cucumbers, pumpkins, and several kinds of excellent melons. Indian corn in small patches is now in seed; also millet and another grain very similar to it, and used in the distillation of spirits. Of fruits, we have apples, pears, peaches, plums, all indifferent; but the first the best. The Chinese do not take much pains to improve the qualities of their fruits, for which they have no great partiality, but choose rather to bestow their labour upon grain and vegetables, and of the latter, they consume immense quantities. Lieutenant Colonel Warren, H. M.'s 58th Regiment, has raised potatoes in the immediate neighbourhood of the barracks, they have turned out tolerably productive, are sweet, but waxy. No doubt the loose dry soil on the sides of the hills (a disintegrated gneiss) would be more suitable to their habitude, than the low damp ground in which they have been grown.

August 1st.—To-day, I have for the first time observed the sickle applied to the rice crop, a small bill hook is used, (see plate) and when a bundle is cut, the reaper conveys it to a square tub enclosed on three sides by a mat screen; against the side of this tub the grain is beaten out, and when it is sufficiently filled it is borne off the field, it is water-tight, and having a round bottom, it can be easily slid along the muddy flats. The straw is piled up in bundles, much after the manner of our sheaves, and when dry, it is carried to the farm yard, and stocked. The principal occupation of the farmer this month has been the reaping and thrashing the earlier rice crop, and weeding and irrigating such as will be late. In many of the fields might be observed one-half of

the plants in seed, and being cut, while the other half, whose growth had been checked by the exclusion of light and air, become now exposed, and in their due season, arrive at maturity. The manner in which the field is laid down, and the short reaping hook in use, makes the separation of the plants very easy. The vegetables and fruits have been much the same as last month, with the addition of lettuce and large chillies.

September.—A great deal of rain has fallen during this month, keeping the paddy fields under water without artificial aid. On the morning of the 2d, there was experienced one of those severe hurricanes not uncommon within the tropics, but rare in this Northern latitude. A great deal of damage was done to the houses of the farmers and to the crops, the filling of which has been somewhat delayed. We now (25th,) see fields of rice yellow in the ear; this is the great body of the first crop. The second is green, and spreading well out, has been carefully weeded, and the soil thoroughly stirred up. Onions, lettuce and buck-wheat are already springing up on ground from which a crop of grain has been just removed.

Millet housed early this month, and the stalks are being now collected for manure.

30th.—Rice still being cut, thrashed and housed, and large patches of ground ploughed, set up in beds, and sown with wheat, mustard, and various kinds of vegetables. In the bazar, we have sweet potatoes, pears, chestnuts, walnuts, and limes.

12th October.—Upon the 1st and 2nd instant, we were visited by another hurricane, and the whole country was laid under water. The crops were thrown down, trees rooted up, houses unroofed, and many of them undermined. The weather, however, during the last 10 days, has been very fine, and on the water being drained off to its proper level, it was found that the crops were not so much damaged as

had been apprehended, nevertheless it must materially affect both the colour and weight of the grain. Old and young have been actively employed in reaping and thrashing, many of the fields are now undergoing ploughing in order to be sown with trefoil. The process is simple, and combined. One manages a plough drawn by a single bullock, he is followed by three labourers with heavy four-pronged hoes, who raise the soil into ridges; a fourth follows levelling these ridges, and indenting them on the top with the back part of his hoe, and into these small holes, the seeds are laid, previously mixed up with mud from the bottom of canals. They are finally covered over with ashes and pulverized soil.

An inferior sort of cotton on the plains is being now gathered; on the loose dry soil on the sides of the hills are patches of a plant having a white flower: this is the polygonum, or buck-wheat.

31*st.*—Towards the conclusion of this month all is activity and change, one crop being ready for the sickle, while another on the same ground is seen springing into existence. The second rice crop has filled out well on the rich low lands and is now being cut, and thrashed out on the field. The plants are much more open in the light soils, and in the interstices of the uncut grain, trefoil has been already sown; a small hole is made with a rake, and the seed thrown in, and covered with a handful of ashes and pulverized soil; in this open, dry, and stimulating bed, germination is rapid; and the plant in its present state looks exactly like European clover. When it has attained some size, the earth is hoed up about it, and by this time its roots have become sufficiently strong to penetrate the hard clay: this it could have ill done in the first stage of its growth, hence perhaps one cause of the failure of clover seed in stiff clays. In other places, may be seen turnips and wheat planted alternately on the same piece of ground, the one arriving at maturity long before the other has attained any considerable height; some patches of

buck-wheat in full blossom, others passing into seed ; in the spaces between the full-grown plants a young crop is now springing up. There are also large fields of a small species of French bean, much used in the preparation of bean curd. In the interspaces of these, trefoil is being sown. The land in this double cropping seems supported solely by assiduous irrigation with water and liquid manure, and the small allotment of vegetable ashes and pulverized earth already referred to, in which the seeds are sown. The young plants are also occasionally sprinkled over with the same preparation, and its stimulating effects are soon observable in the *deep green colour* of the leaf. Fine beds of radishes on the slopes of the hills, on ground lately cleared up of cucumbers and millet.

21*st November.*—During last week much of the low paddy ground has been drained, ploughed, and collected by the heavy 3-pronged hoe into beds, and laid down in mustard ; the plants of wheat had been raised in forcing beds carefully prepared for that particular purpose. Of each little farm, about one-fourth is thus laid out in a crop of mustard ; another fourth with trefoil, and the remaining two-fourths in wheat, barley and beans, leaving only a very few fields uncultivated, and these are either under water or ploughed over and exposed to the keen frosts of winter. Nearly the last sheaf of the second rice crop has been housed, and old and young are now busily employed in getting up the sweet potatoe crop, and cutting and tying up in bundles the species of bean already mentioned, and which after being dried in the sun is afterwards used to prepare bean curd, a very favorite article of diet among the natives. The soy bean is also much cultivated here. On such patches as had been under cotton cultivation, the plants have been pulled up, and the ground sown with trefoil. The cotton is of inferior quality here, and less attention appears to be bestowed upon it than in the other details of the farm. I think it probable, that the

foreign manufacture may eventually in a great measure supersede the home growth, as much on account of the greater cheapness of the foreign growth, as by reason of a steadily increasing population demanding an increased supply of grain.

During the first half of this month the weather was particularly mild, clear, and cool; but during the latter, there was much rain with fresh cold northerly winds, the thermometer being as low as 47°.

1st December.—The trefoil all sown, and much of it well advanced, being about four inches high, with a rich deep green-leaf, wheat and barley about the same size, looking fresh and filling well out. Ground for barley still being prepared and sown. These grains are not transplanted; the ground is first well ploughed, then formed with the heavy hoe into beds about three feet wide, in which rows of small holes are made with a stone dibble, at a distance of about one foot apart each way: a few grains of corn are thrown in, and over this again, a handful of the ash and pulverized earth, without which no seeds seem to be raised. In this open and dry bed germination is both quick and favourable. On the long slopes of the hills much of the land from which sweet potatoes has been removed is being laid down in grain; it is not ploughed but turned over with the hoe, and instead of planting the grain in a layer of ashes, it is more common to pour into the hole a small quantity of liquid manure; the soil is yellow, deep, and open, and formed of disintegrated rock. About one-half of the sweet potatoes lately taken up, have been cut into thin longitudinal slices and exposed upon mats to the sun; when perfectly dry they are packed in gunny bags, and preserved for use. In appearance they are quite white, and have a sweet and mealy taste. As potatoe is the best preventative of scurvy, might not these be found serviceable in long voyages, and even in the field when vegetables are not to be procured? Cabbages, turnips, radishes,

and a species of lettuce very plentiful. Observed in many places rotted straw, and placed on the surface of the soil between the rows of young plants, apparently with the intention of affording them heat, and preventing evaporation. Fine beds of onions, the tubers of which, however, are very small. It may be observed of all Chinese vegetables, and is indeed in some degree perhaps dependent upon the use of the liquid manure, that the leaf is most luxuriant, while the root, as in the carrot and turnip, is small, and has not the flavour of the European species.

18*th December.*—Crossed the island to-day from Tinghai to the opposite shore by a circuitous route, having rode about a distance of twenty-six miles through an alternation of beautiful cultivated vallies and bleak mountain passes. Many people employed on the sides of the hills cutting the long grasses for firewood, while others are busily engaged in plucking the leaves of the tallow tree (croton sebiferum.) The men ascend the trees by ladders, and with a sharp hook attached to a long bamboo, lop off the slender twigs from which the seeds spring. The women and children (and this is almost the only out-work I have seen these engaged in) pick them up, tie them in small bundles, and remove them in baskets to the farm-yard; they are then either sold to the tallow chandler, or sent to be expressed at the manufacturers. Still sowing barley, chiefly in the low lands, also transplanting mustard plants from the beds into the fields; hoeing and setting up the earth about the wheat and mustard, which are well sprung up; after each of these hoeings the liquid manure is applied, and in addition to this, many fields present a thick layer of dung spread in the spaces between the plants, and this again is covered with a layer of earth taken from the furrows on each side of the bed, which are not more than three feet wide.

31*st December.*—The weather during the last fortnight has been more mild than is common at this season of the

year; but the winds have been occasionally sharp, and the evidences of winter are every where very apparent, particularly in the bleak appearance of the hills, whose brown rank grass is being cut for fire-wood, conveyed to the farm-yard, and piled up in square stacks. Few labourers are now to be observed in the fields, and those are chiefly employed in hoeing about the mustard plants, laying cow's and pig's dung between the rows, and covering it with earth from the furrows, as already noticed. This both shelters the plant, and affords it sustenance; after each hoeing they are also watered with the liquid manure much diluted, and to such plants, whether of bean, barley, wheat, mustard or trefoil, as look backward or withered, an additional quantity of wood ash is applied to the leaves, and around the roots. There is still some ploughing in the wet clay soils, for the purpose of exposing them to the air, which the Chinese are well aware has a fertilizing effect. At home people cleaning and preparing the rice may be every where seen, while the other members of the families are repairing the tombs of their ancestors, thatching afresh the coffins of wood that are exposed in the open air, and burning with some ceremony the old thatch, cutting the grass over the graves, or building more or less expensive monuments of hewn stones to those who have lived long, and worthily, and died respected. Where the peasant has spent and ended his life of manly toil, there he is buried, and around each hamlet may be observed the monuments, some of them very humble, but all very chaste, which have been dedicated by grateful descendants to the successive cultivators of the same piece of land through many successive ages; hence springs one powerful cause of the cherished fondness of a Chinese to the place of his birth, and his unwillingness ever to forsake it.

15th January 1844.—A few people still engaged on the hills and among the graves in cutting the long grass and brushwood so much needed as fire-wood, and the ash of which we

have had so frequently to make mention of: others hoeing, and thinning the mustard plants, the young shoots of which are used as a vegetable. The wheat and barley have been kept carefully weeded by the hoe, represented in plate IV. fig. II., and this process presents something worthy of observation. I have remarked, that the soil, which has been for sometime in immediate contact with the plant, is removed, and replaced by that between the rows, thus affording a supply of earth undeprived of its fertilizing properties, and as it were diffusing equally over the field the degree of exhaustion occasioned by the rising crop.

The nights and mornings have been cold, but the sun powerful during the day, and the progress of vegetation is very marked, particularly in the rich leaf of the trefoil; many fields of this important crop which had been sown late in the season, and more particularly on unploughed ground, are just receiving a very fine sprinkling of ashes applied directly to the leaf. The turnips grown betwixt the rows of wheat and barley have been nearly all taken up for domestic use. Observed one or two fields manured from the farm-yard, and then ploughed over and exposed to the air.

30th January.—During the last fortnight the labours of the field have been much similar to those just detailed. The whole of the rising crop of mustard, grain, and vegetables has been well hoed, and between the rows of plants farm-yard manure laid down, and this again covered with earth taken from between the beds, to prevent evaporation. The liquid manure has also been applied in a very diluted form, and the appearance of the crops is now very promising. A second application of the wood ash has been made to the leaf of the trefoil, and in quantity varying with its late or advanced appearance. There cannot be a doubt but the ash acts as a stimulant, for although the several sowings are often at very distant intervals, still the farmer manages so well, that all arrive at maturity about the same time in spring.

The supply of fish during this month is most excellent. Soles, seer-fish, (equal to salmon,) rock cod, and mullet in great abundance. Oysters of good flavor; and other shell fish, as cockles, muscles, &c. Vegetables of the usual kinds; the best are the large Shan-tung cabbages imported from that province. Pheasants, hog, deer, wild duck, duck and teal, very cheap. The mutton in high condition, averaging about one mace (three annas) per catty. A few woodcock have been shot on the island, but snipe are again scarce, and do not become plentiful until spring. The weather has been keen and frosty within the last few days with snow, and the canals are now frozen over.

10th February.—Thinning mustard fields, the young plants being sold in the bazaar as a vegetable. The plants along the sides of the foot-paths have been sprinkled with a saturated solution of soot; this is done with the view of rendering them unfit for edible purposes, which makes them less liable to be stolen by passers-by or eaten by cattle. Observed a small patch of wheat which had also been thinned, and the thinnings transplanted. A few labourers to be seen hoeing, but more are engaged either in applying the liquid manure, or in forming dung heaps. Observed on the corner of a field fifteen deep square pits dug out in the thick clay, and in the course of being filled up with manure of almost every description; those I could distinguish were pigs, dogs, human fæces, cows, bones, and other offal. These were all worked up with water, layer after layer, by means of heavy rakes, into a homogenous mass, then packed well down, covered over by mats, and plastered with clay.

Groups of villagers are to be met with in almost every valley, assembled together by a common interest, and all partaking equally in the labour and expence of repairing the roads and bridges, and forming embankments. These are much required this year on account of the heavy damage occasioned by the late inundations and hurricanes. Many of

the people's houses have remained up to this time with the walls unbuilt, and with only a temporary thatch covering to protect their inmates from the hard vicissitudes of most severe weather; the care of their fields had demanded every moment of their time.

The preparations for the holidays are now commencing with great activity.

14*th February.*—The labours of the farmer, even those of the artizan and shop-keeper, are for a period suspended, and the attention of the people is carried away to other duties than those requiring the sweat of the brow, but no less called for by the customs of the country, than impressed upon them by the laws of nature. Great numbers now visit the temples for devotional purposes, while all present offerings at home. In every house, and in the meanest huts, may be observed a table well laid out with pork, fowl, fish, rice, salt, tea, sugar, oil, vegetables, and fruits, in fact with all that they consider the necessaries of life. These are the first fruits of the harvest, and with lights burning, gongs beating, and amidst the most humble prostrations of every member of the family, are they presented to the Giver of all gifts. The degree, order, and gravity with which this is done, does credit to their sense of decorum. Among the other relations of life enjoined upon the people at this time, is the payment of their debts; and so deeply is the character of individuals at stake in this matter, that every possible shift is made to discharge their obligations. They will even pawn their furniture and dress, or borrow money at heavy interest, rather than incur the censure of the public voice. This is also the favorite season for entering the bonds of Hymen, and the gay processions with their rude music that accompany the bride to the house of her accepted suitor, are none of the least interesting spectacles of the period.

I need scarce observe much of the visits of ceremony paid at this time; the feasts, and theatrical performances both

private and public; the more humble representations of Punch and Judy, rope-dancers, jugglers, and other like gentry, that are now let loose on the society by acknowledged privilege. Well have the people earned this brief relaxation from long continued toil, and young and old, rich and poor, all share in, and enjoy gaiety without care or reservation.

1st March.—Victoria, Hong-Kong. These notes have been rather abruptly terminated by my being ordered to Hong-Kong with Her Majesty's 55th regiment on the 17th ultimo.

There is little however of practical interest in the husbandry of this month, as far as I can recollect from observation during the spring of 1842 and 1843, so that upon the whole the diary will be found to furnish nearly as much as can be derived from observation alone, but comes far short, I doubt not, of what could be ascertained by any one well conversant with the language of the people.

The weather was cold and clear on the 1st February, with ice on the canals; for the following week it was mild, with slight rain on 5th and 6th, and vegetation made some progress on the 11th, 12th, 13th and 14th. The thermometer stood at 34°, 29° and 26°, accompanied with piercing cold N. West winds. The change from this, into the mild, and often hot and sultry weather which prevailed during the latter part of the month at Hong-Kong, made a strong and disagreeable impression on the feelings.

April, 1844.—Whilst lately travelling over the island of Hong Kong, I observed several small patches of ground being prepared for rice; the process was similar to that already described, but I was sorry to see that women were employed in the fields, and in its most laborious duties wading knee-deep in the mud planting the rice seedlings, there is certainly some influence within the warm regions of the tropics that derogates from the manliness of the people. The story of the vain empress, who to improve her deformed feet resolved

to contract them, and to make this contraction a rule of beauty, at once occurred to me, and it now struck me for the first time, that the good lady had more likely affected a spurious taste to save her sex from slavery, and that by inculcating the confinement of their feet, she had adopted the only means of confining them to their proper duties, those of the domestic circle. The custom prevails universally in the North, and I have never there seen a woman at any laborious work in the fields.

Remarks.—The preceding notes place it beyond a doubt that the Chinese, even in this northern climate, and with a long bleak winter, during a greater part of which vegetation is suspended, can nevertheless procure from the soil one or two grain crops, besides two of vegetables. In the south three crops of grain are I believe not unusual. The ground is never fallow, still there is no evidence of its exhaustion after ages of continued cropping, and the rice that is raised presents as large and fine a grain as could be wished.

A knowledge of the practice which ensures such results, must indeed be interesting; its leading feature are these :—

1. A soil retentive of moisture.
2. A most abundant supply of water for irrigation.
3. The universal practice of drill, and dibble cultivation.
4. Repeated ploughing, hoeing, and stirring up the soil.
5. Attention to the weeding, and *ventilation* of the plants.
6. The green manure incorporated with the soil, whereby its due proportion of vegetable matter is kept up.
7. The wood-ash mixed with earth in which the seeds are sown, and the same ash applied to the leaf of the plant.
8. The direct and often daily application of the liquid manure according to the seeming necessities of the plant, and the soil.

Each of these might form the subject of a separate paper; I shall however dismiss them at present in a few words. The

bearing of all of them must be obvious, and their *modus operandi* is well explained in the excellent work of Liebig, of whose doctrines they are indeed a strong confirmation, a confirmation so extensive, practical, and yet unknown to him, that he may have cause to be proud of it; it is seldom that theory and practice, science and experience, do thus accurately tally.

Drill cultivation.

The universal practice of drill cultivation enables the labourer to keep the weeds under, and by his periodical visits to the fields he retains them clear at little labour, or cost. By this process also the seed is placed in the ground under favourable circumstances for germination, the ash and pulverized earth in which the seeds are sown, form a light open vegetable soil in direct contact with the germ, which it stimulates as well as nourishes. The ventilation of fields laid out in this manner is also perfect, not as may be daily observed in our heavy wheat fields, where the ground and roots never receive either light or air, although the wind is whistling over them. The stalks of grain planted by the dibble are generally strong, and resist the elements. By the same method two kinds of plants may be reared on the same piece of ground; the one, generally vegetables, arriving at maturity long before the other has attained any great height. This is often done as much to keep the farm people employed as to preserve a continued supply of young vegetables, which with rice and a very scanty allowance of fish, form the diet of the labouring classes. The Chinese seem also to have some notion that a change of crop is beneficial, and not so exhausting to the soil, but I am not well informed as to the principles that guide their cropping.

Hand-weeding.

The system of hand-weeding is here in full operation, and the weeds are buried in the soil. The Chinese farmer knows well that when weeds are allowed to perfect their seed, the ground undergoes a comparative scourging, hence the trefoil and lupine are plough-

ed in as the flower begins to open, and the bean as the pod is forming. The soil is for the most part (and particularly in the plains) highly retentive of moisture, hence tanks are rare, and canals retain the water equally well, serve as a medium of transport, and winding among the fields afford greater facilities for irrigation.

Soil and canals.

These imperishable veins of wealth that cover the whole face of the land, are the noblest monuments of legislative wisdom, and of the nation's industry and enterprize; while the glory of successful wars, and extended empire, has passed away and is forgotten, the memory of those who planned, and executed these less dazzling, but more solid works, is cherished, indeed almost adored, by a grateful posterity. Famine has been almost banished from the empire, or its operations are become so partial, that the plenty of one district fully supplies the scarcity in another. Without such works how could China support a population whose great density has not been exaggerated, and where early marriage is enjoined, a numerous family, viewed as the highest gift of heaven, and where polygamy is sanctioned to all, and generally prevails among the middle classes; these are symptoms of a healthy state of the empire, and present a strong contrast with modern Europe in its most palmy days, where prudence and necessity so often enjoin a cheerless celibacy.

2d. The care of the Yellow river, to restrain it within due bounds, and to regulate the sluices, is one of the most important trusts under Government. All other great rivers, and the grand canal are equally looked to by the State, but smaller streams and canals are regulated by the individuals whose grounds benefit by them. At Chusan, for instance, where the small streams are apt to be dried up during occasional draughts, their waters are prevented from wasting themselves in the sea by means of dams and sluices at their mouths; the canals are thus always kept filled; however low

the stream, none of it is lost, and it is only on the occasion of a very unusually prolonged dry season, as occurred in 1843, that the rice crops become endangered.

The grand canal and all others fed from the Yellow river, Yangtzekiang, the Min, and other great streams, can never be deficient in a supply of water, as their sources are never dried up.

A glance at a good map will show how admirably this country is watered by nature and by art; its great rivers running from west to east traverse the whole breadth of the country, water every province, and render the agriculturist almost independent of local rains. Intersecting these again, and fed by them, is the grand canal running nearly north and south, connecting both extremities of the empire, watering the intermediate country by innumerable channels that branch off from it, and affording a safe means of transport for a people who are unskilled in navigation, and whose ships are exceedingly rude, and can only make coasting voyages while the monsoon is favorable.

Would that some such great work as this canal could be accomplished in India. What consolidation of our empire, what increase of revenue, of population, and of human happiness! Those fearful famines that carry off their tens of thousands, sweeping away whole communities, their stocks and their habitations, and rendering a once fertile region a very desert. The miseries of such awful visitations, the lingering deaths, the ruin of families, the loss to the revenue, and the danger to the public health, exceed that of the most destructive wars; witness only the recent famine in the Guntoor district, where 150 thousand men, women and children with all their cattle perished of hunger and thirst.

China is nearly exempted from such calamities.

The noblemen and gentlemen of England have formed rich and powerful societies for the promotion of agricultural improvement, the best means of enriching the soil, of improv-

ing the quality of the grain and the breed of stock, and by mechanical invention to diminish the expence of agricultural labour; these are undoubtedly high motives, and have done great good. China is behind in all such institutions, but her paternal Government are opposed to any measures for diminishing agricultural labour, the instruments of which are intended rather to direct than to abridge it. and on the principle that it is the duty of the Government to find employment and food for her industrious classes, she has given the labourer a deep interest in the soil by fixity of tenure. She inculcates, and indeed enforces (with that unity of decision which is the best feature of her despotizing,) industry and prudence, and points out to the farmer that if he repose in these virtues he will best secure his own independence, and that degree of comfort which makes life worth possessing. I have never seen in this country that painful, and often mournful sight,—a flitting,—that parting from a hearth consecrated by old and kindly associations, and deep in the prejudices of a half civilized people. Powerful ought to be the necessity or expediency that can justify such a step, and hard must be the heart that can contemn these sacred feelings, or look on them with indifference.

The produce of Great Britain and Ireland, might, I think, be doubled, by following the Chinese system; but the example must be shown by the landed proprietor under whom the most prudent and intelligent of the people ought to be employed to show example to their countrymen; perhaps the system of model farms might best carry out these views. There would be necessarily,—

1st. A judicious system of small allotments under the eye of a responsible head.

2d. The prudent and intelligent among the poor to hold these at a small quit rent, conditional on their adopting the drill cultivation.

3d. The practice of irrigation ought to be encouraged, and stall feeding in preference to pasture, as they obtain in China.

4th. The careful storing up of the night soil and urine of cities and towns, which form the bulk of Chinese manure, but in England run almost wholly to waste.

5th. All wood-ash to be preserved, moors to be cut, and burned for the same purpose, and peat moss would in the Highlands of Scotland form an inexhaustible source for a supply of carbon, it might become indeed an important article of export. Abundance of water, of carbon, and of the salts contained in urine, are, among the Chinese, the leading nutriments of vegetables. The soil is not really richer than other favored spots of the globe, but it is made artificially so by a great amount of labour, and by the careful storing up of the waste in the animal and vegetable kingdom (little attended to by other nations), and by never stinting the plant in its supply of water, of light, or of air.

A Chinese farm is indeed a perfect picture of order and neatness, its like is no where else to be seen on a small scale. The question of how this arises, involves the history of ages, for nations like men are very often the children of circumstances. In the neighbouring Spanish (the Philippines) and Dutch settlements, with a climate and soil superior to any parts of China, but one crop of rice is obtained, and few if any vegetables are cultivated.

In July and August last I had an opportunity of examining some of these islands, the paddy fields bore every evidence of neglect, and rank grass which had nearly perfected its seeds covered their surface. On questioning an intelligent Chinese emigrant as to the cause of the difference between the condition of fields here, and in his native country, he replied "that by one crop the people made sufficient to supply their wants, and that they were too lazy to work for more." The destitute state of the poorer classes in Great

Britain and Ireland, would imply that a strong necessity exists for additional zeal in the prosecution of agricultural improvement, with greater encouragement to the practice of husbandry. In small allotments at home we too frequently observe the soil exhausted, and the rising crop being buried by luxuriant weeds, or sinking after drought, although a river lie but a few yards distant. The agricultural class is the most robust and most patriotic of a nation, they owe this perhaps to their position, but they ought to be fostered, let us hope they are not being allowed to degenerate. It has been observed by one of the best of men, and it accords with the experience of every age and every people, that a population is always more orderly and virtuous when scattered over a district than when congregated in masses. It is also less liable to be agitated by political speculators, when afforded the means of constant employment and moderate subsistence, than if subject to the fluctuating condition of the manufacturing market so contingent on our foreign relations, and the progress of mechanical science in other states.

Explanation of the Plates.

Plate I.

Fig. 1.—Reaping hook. The edge is smooth, and finely tempered. It is used for a variety of purposes, as to cut brushwood and vegetables.

Fig. 2.—The plough. The frame-work is wood, it comes to pieces, and the whole is so light, that at even-time the labourer carries it home over his shoulders. The *share* is made of cast iron: it has no coulter.

Plate II.

The common harrow. The row of large perpendicular teeth are made of iron. The driver stands on the cross bar of the frame *a*, resting his arms and breast on the bar *b*. The yoke which is made of wood, is seen at *c*.

This harrow I have only seen used in paddy fields, which are always ploughed and harrowed, partially inundated. In dry soils the Chinese

do not use a harrow to break up the clods, they find the heavy hoe do this much more effectually.

Plate III.

Represents the heavy harrow for cutting up the green manure, and incorporating it with the soil. *a. a.* and *b. b.* the strong frame-work. *c. c.* the rows of horizontal concave knives.

Plate IV.

Fig. 1.—A light shovel for scooping up the earth between the beds, and placing it between the rows of plants.

Fig. 2.—The hoe most commonly used in weeding.

Fig. 3.—The wooden rake for stirring up the water and mud between the rows of rice plants.

Fig. 4.—The heavy four-pronged rake in general use for breaking up all stiff soils, after ploughing; this rake is used to form the field into rigs or beds, in which the seedlings, whether of grain or vegetables, are planted.

Plate V.

Represents the method of carrying heavy burthens of every description. The pails *a. a.* are those used for conveying the liquid manure to the field; they are often furnished with covers.

Plate VI.

Fig. 1.—One of the pair of baskets used to convey farm-yard manure or earth to the fields. It is made of twigs of bamboo.

Fig. 2.—The shield worn over the face for protection while the labourer is on his knees weeding the rice fields.

Fig. 3.—The wooden chain pump. This is the only means of raising water used on the Island of Chusan. For the modifications of this machine, and for an account of others in use among the Chinese, vide Mr. Davies's Work.

Plate VII.

Fig. 1.—A bamboo rake for dressing corn, and turning it over to dry.

Fig. 2.—A heavy hoe for breaking very stiff clay soil, it very much resembles our mattock.

Fig. 3.—A rice mill, *a.* is the hopper, *b.* the stone roller which traverses in the stone gutter *c.* The opening at *d.* is the outlet for the cleaned rice. *e.* is the yoke, it is drawn by a bullock.

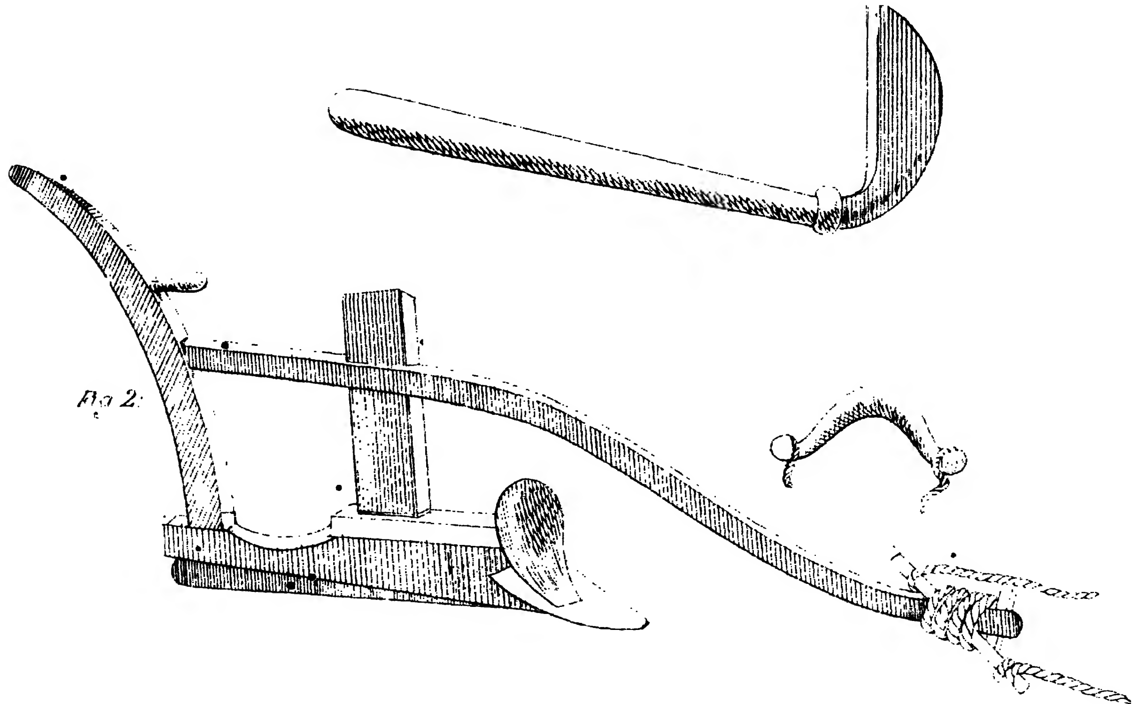
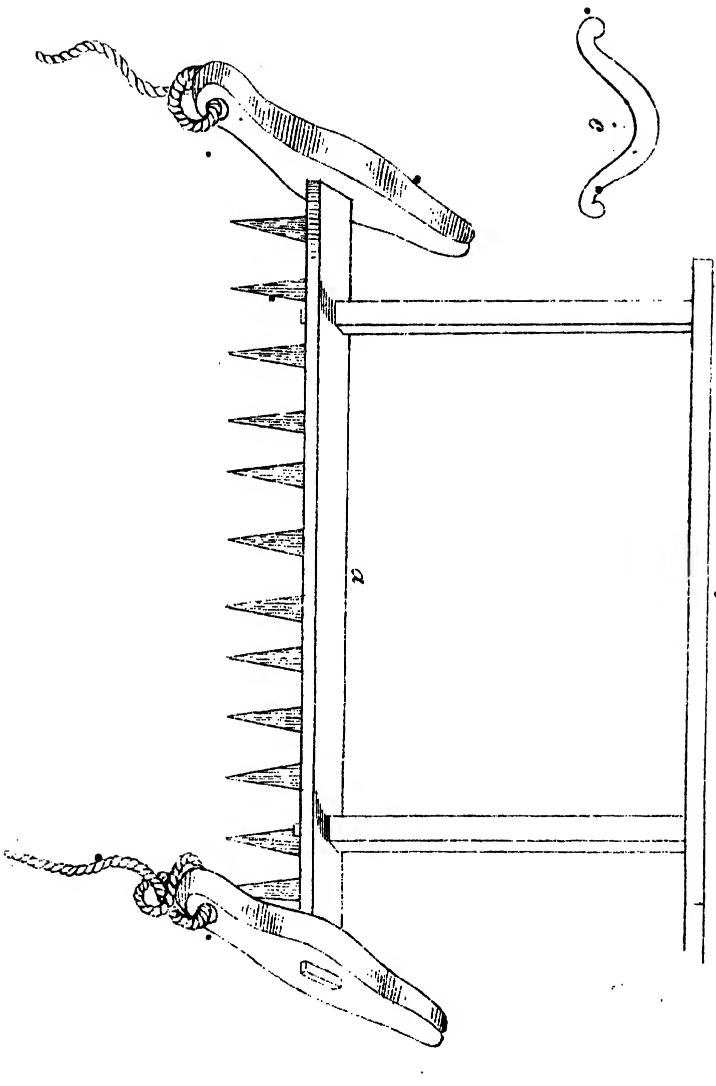
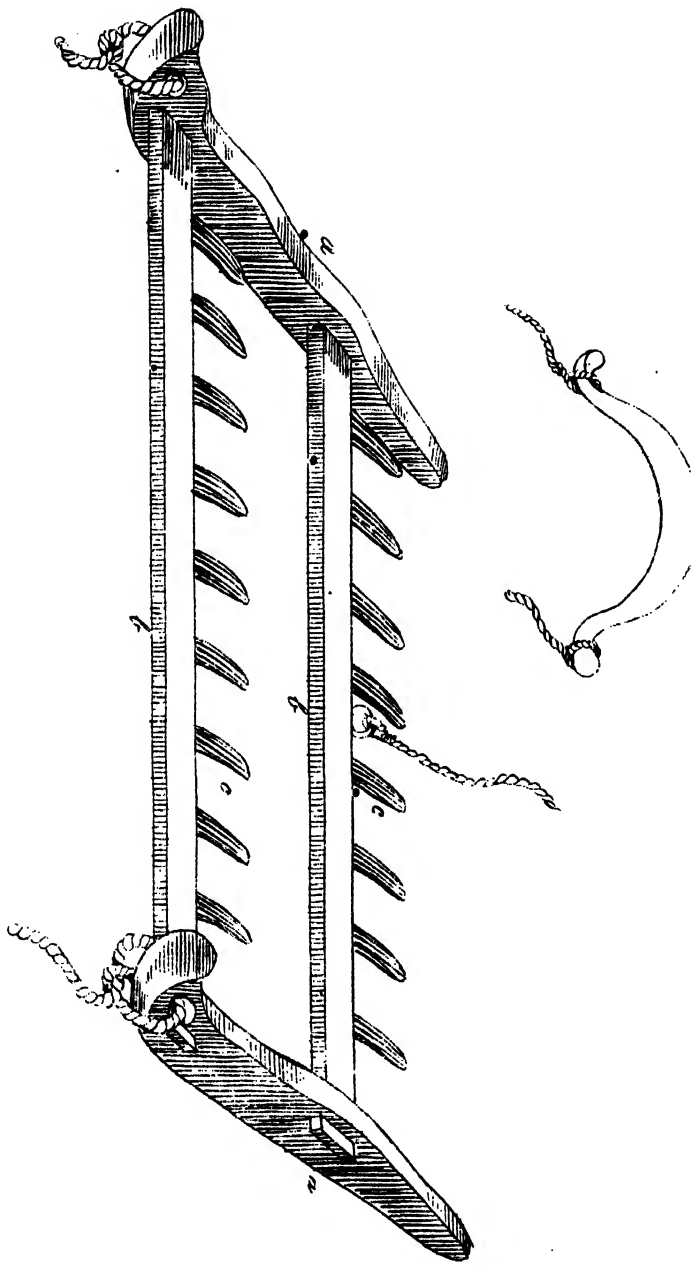


Fig. 2.





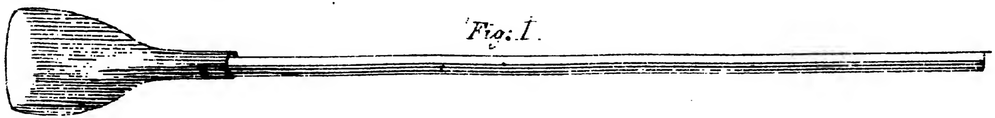


Fig: I.

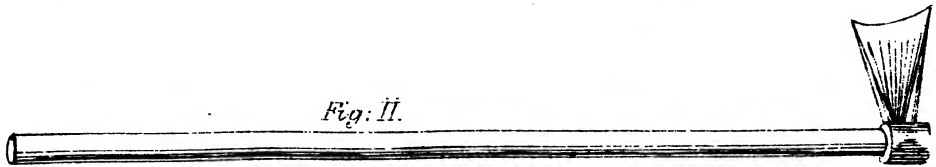


Fig: II.

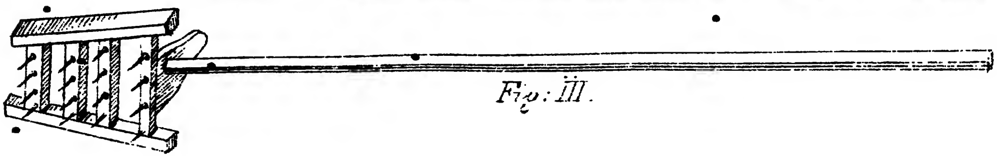


Fig: III.

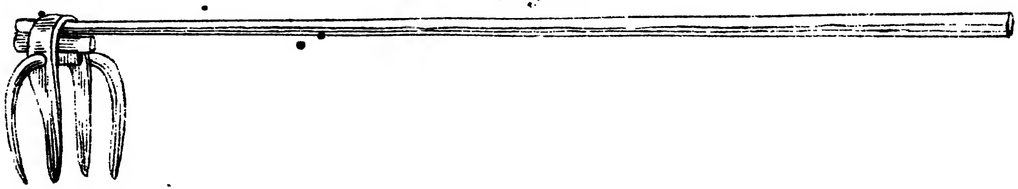


Fig: IV

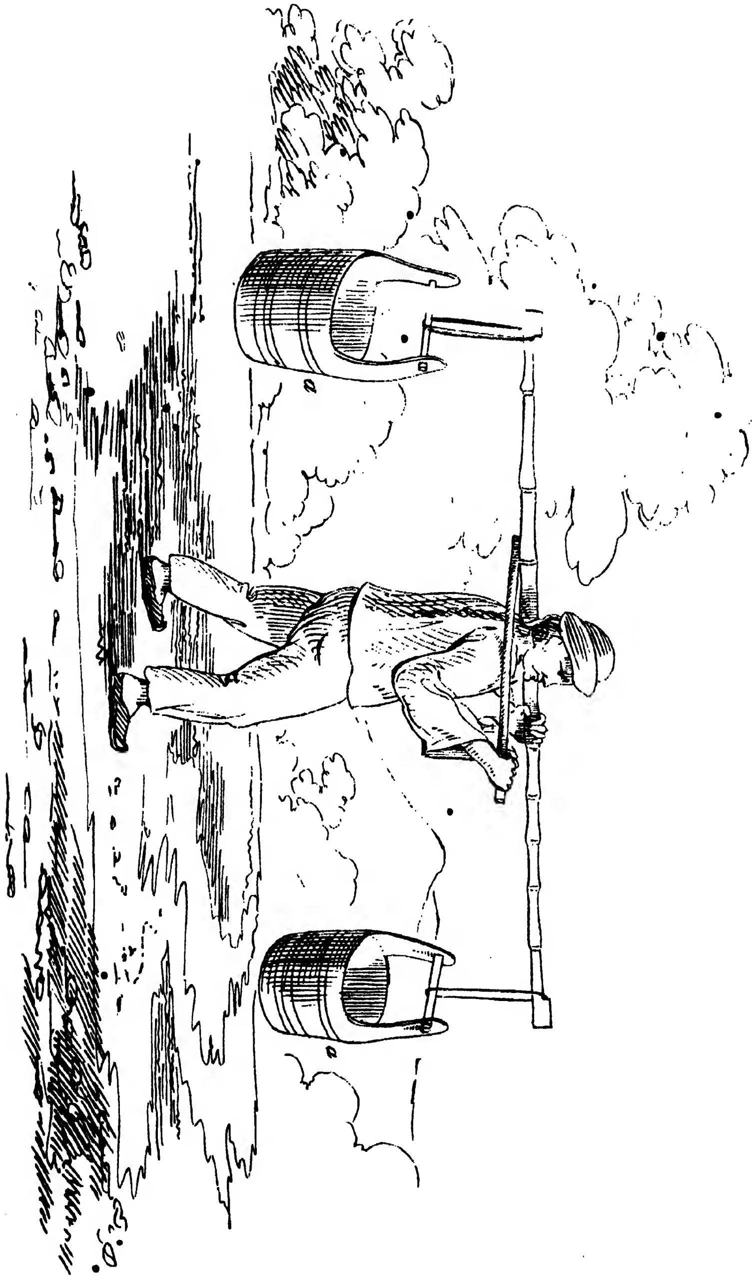
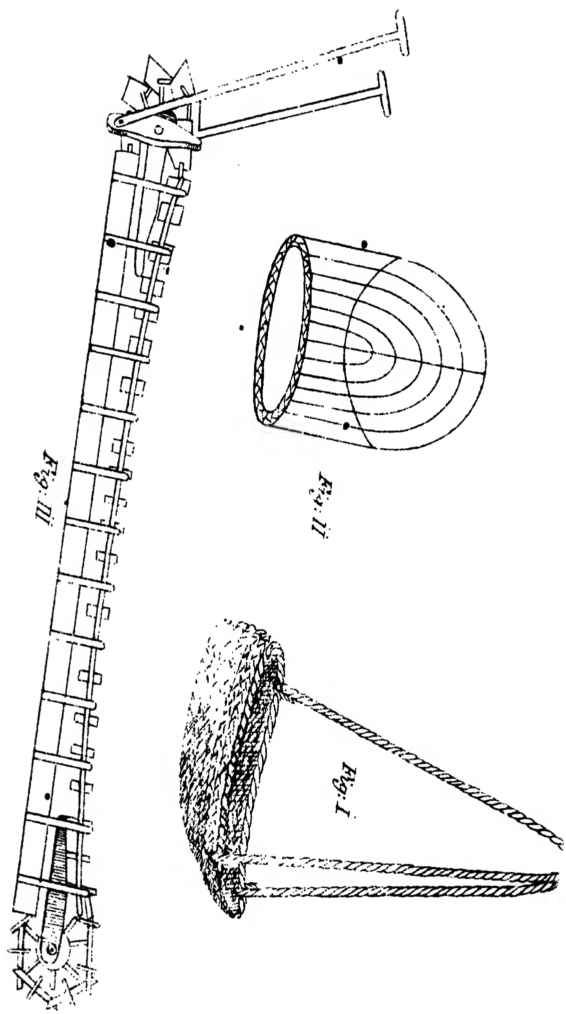


Plate VI



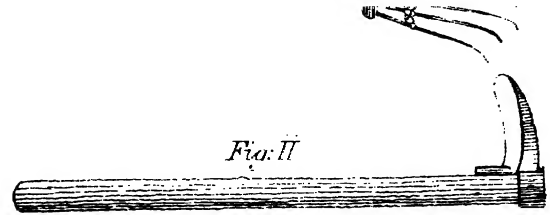


Fig: II

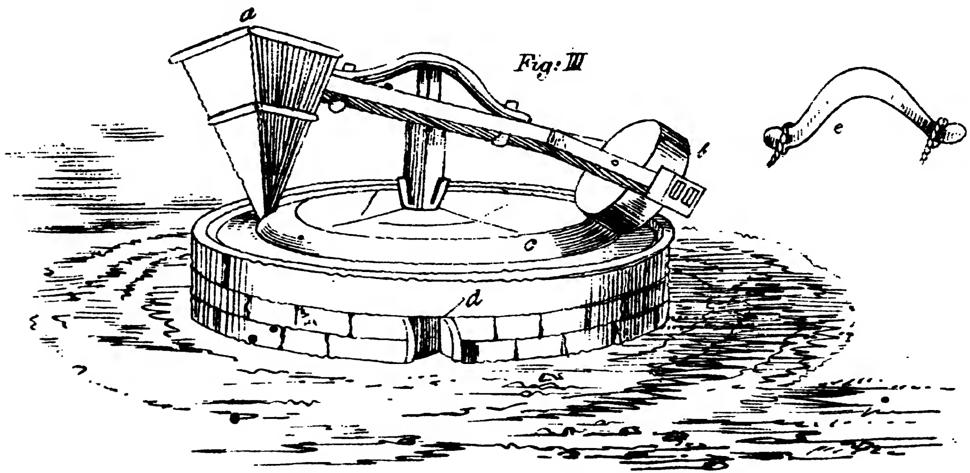
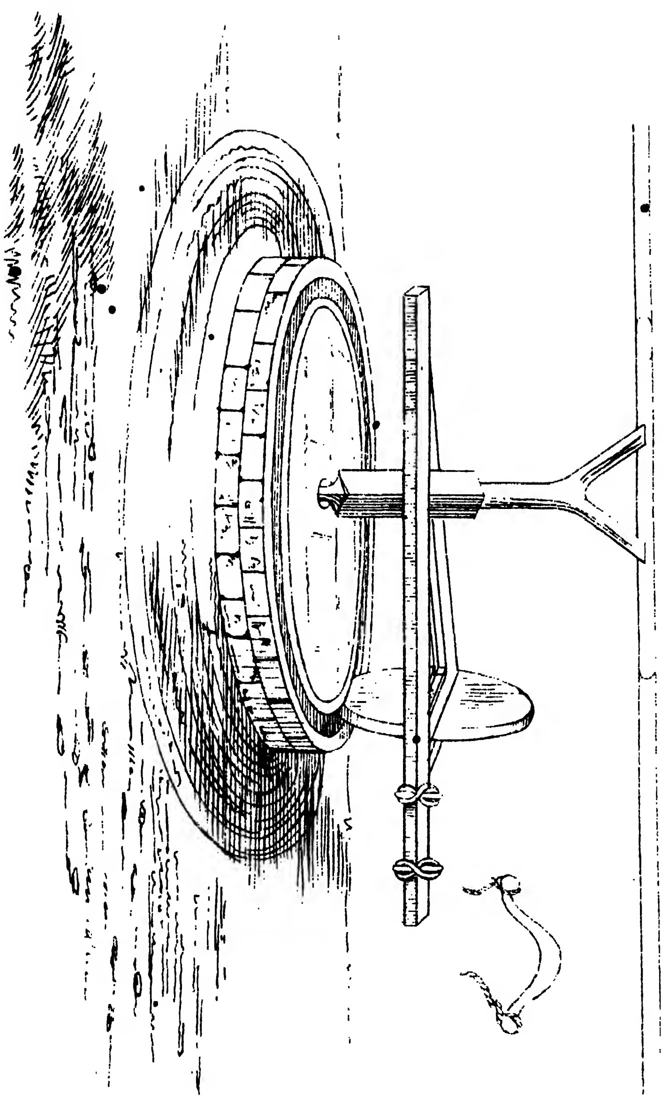


Fig: III

Plate VII.



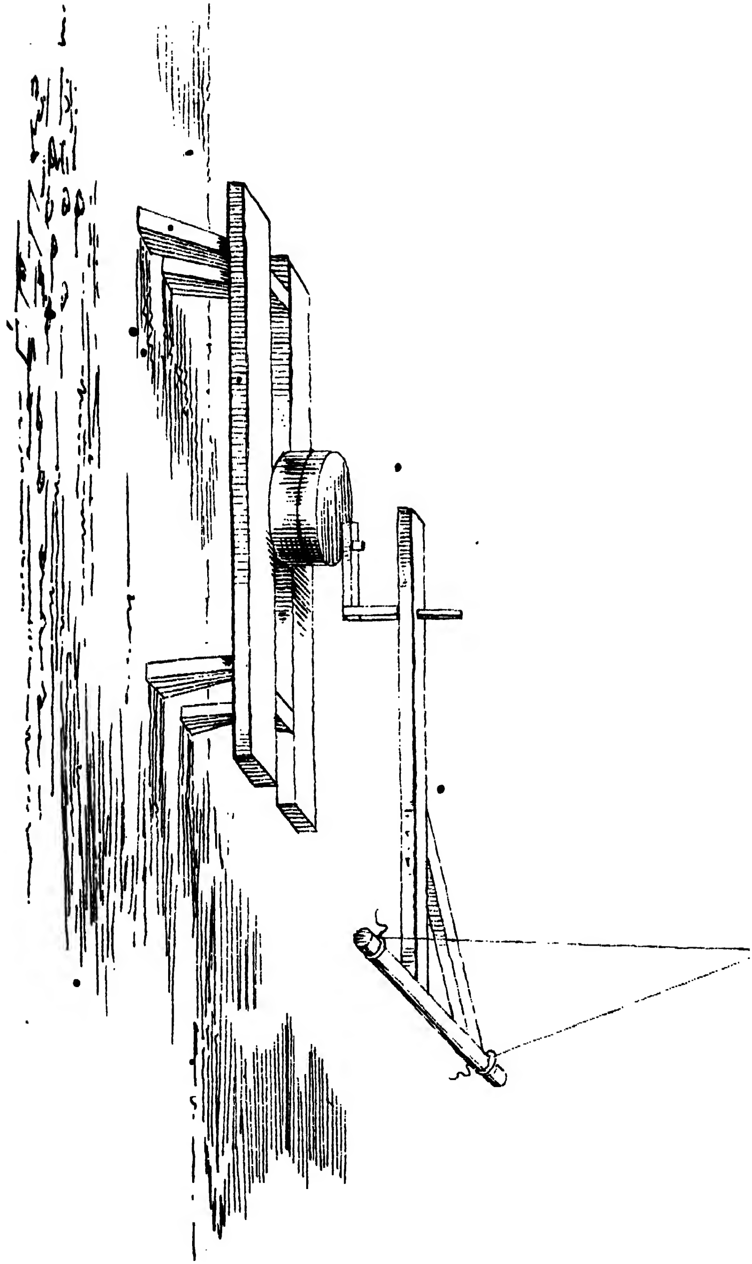


Plate VIII.

Represents another kind of grain mill, which is most commonly used to grind millet. *a.* is a stone roller which traverses in the gutter *b.* This machine is worked by a small bullock.

Plate IX.

A mill for making bean curd, also used at times to grind rice: it consists of two granite stones, the lower one, fixed to a heavy stool, has a groove round its upper margin, in the upper stone there is a hole at the top by which it is fed, close to this the handle is attached, it is worked by hand.

On the Black-Dye Plant of the Shans; and on the Gutta Percha, or Gutta Tuban. By W. GRIFFITH, *Esq. F.L.S.*

The specimens of the plant, said to yield the above product, which were communicated to the Society by Mr. Landers, belong to the genus Diospyros of the natural family, Ebenaceæ.

This family, which forms not an unimportant part of the Indian Flora, is remarkable for the hardness and blackness of the wood,* of which Ebony and Iron-wood are notable instances. It also appears to be remarkable for an astringent principle,† (dependent in one species at least on the presence of tannin,)‡ to which the extreme acerbity of the fruit of some before maturity is probably attributable.

A few yield an edible fruit;§ one is imported dried from China, and one is sold in the Calcutta market under the name of Mangosteen, to which exquisite fruit it does not bear any resemblance in appearance or taste.

The fruit of the Gab, a well-known and valuable Indian tree, (D. Embryopteris,) yields a viscid juice used extensively

* Lindl. Introd. Nat. Ord. p. 227. Endl. Gen. Pl. p. 742. Royle. Ill. p. 261-2.

† Voigt, Hort. Suburb. Calc. p 344-5. No. 9. 14. Royle Ill. p. 262.

‡ Voigt, Hort. Suburb. Calc. p 345. No. 14.

§ Lindl. Intr. l. c. Endl. Gen. Pl. l. c. Voigt, Hort. Suburb. Calc. p. 344-5. Nos. 8. 9. 14. 16. Royle Ill. p. 262.

It belongs to the third subdivision of the third section Eudiospyros, De Cand. Prodr. 8. p. 224, and appears to approach D. montana* and sylvatica.†

EXPLANATION OF THE PLATE.

1. Branch, natural size.
2. Young fruit, cut across.
3. Ripe fruit.
4. Seeds.
5. Another, one of the flat faces.
6. Long section of albumen.
7. Embryo.

Figs. 5, 6, 7, more or less magnified.

On the Gutta Percha, or Gutta Tuban.

This substance of which an analysis was given by Dr. Mouat,‡ was stated by me,§ from examination of a small branch without flowers or fruit, communicated by the Rev. Mr. White, Chaplain of Singapore, to be produced by a plant of the Natural Family Sapoteæ, and to have the characters of the genus Chrysophyllum.

The leaves are alternate, rather distant, narrow lanceolate, attenuate at the base, caudato-cuspidate at the apex; the under surface of a golden brown colour with indistinct distant straight secondary veins.

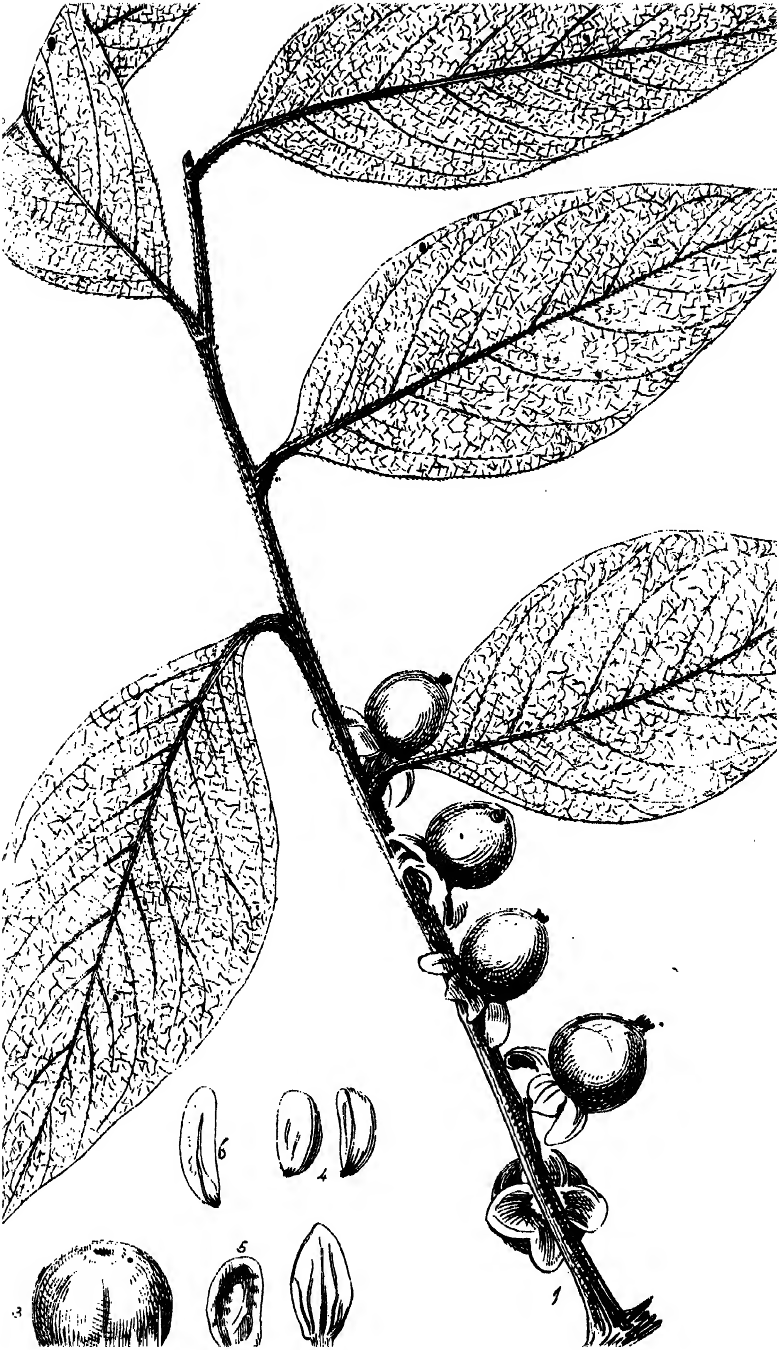
To extend our information regarding this article, I have the pleasure of submitting an analysis of the Gutta Percha, and of the gum of the Sapota tree, (Achras Sapota,) procured from specimens in the Honorable Company's Botanic Gardens. These analyses, which were made by Mr. Scott of the Honorable Company's Dispensary, were communicated by Dr. M'Clelland.

* Roxb. Icon. 9, t. 49.

† Roxb. Icon. 9, t. 48.

‡ Journ. Agr. and Hort. Soc. 2. p. 101.

§ Calc. Journ. Nat. Hist. 5, p. 116, where by inadvertence the fruit is stated to be edible, instead of to produce a concrete edible oil.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4
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3
1

"The Gutta Percha forwarded to the Medical Board, by Dr. Montgomerie from Singapore, is one of those neutral vegetable substances, of which a proximate analysis cannot be made. On a careful examination, I have found it to possess the following properties :—

"It is insoluble in water and in alcohol; soluble in volatile oils, and partially so in ether, from a solution of which it is precipitated by alcohol.

"It melts when exposed to a temperature of 248°, and on cooling, remains in a semifluid adhesive state. When heated sufficiently in the open air it catches fire, burning with a strong yellow flame, and emitting much smoke.

"On distillation it furnishes a volatile oil, similar in all its properties to Caoutchouc.

"It is insoluble in petroleum and in nitric ether.

The Gutta Percha is in thin films, varying in colour from a pale yellow to a pinkish tinge, and is destitute both of taste and smell. It is hard at a common temperature, but when immersed in boiling water, it softens so much, as to be capable of being beaten into a mass, and formed into any shape required; this, however, must be done immediately, for the mass on cooling becomes hard and unyielding.

"When in a soft state, it can be stretched out into thin slips much beyond its usual length, but it does not recover its former bulk when the force is withdrawn. The slips are transparent and elastic.

"I feel no hesitation in pronouncing the Gutta Percha a species of Caoutchouc, possessing unquestionably some of its principal properties, but it is a species which I believe has not been examined before."—*J. G. Scott.*

"The juice of the Achras Sapota, was received in a concrete state, the greater portion in rounded pieces, or tears of various sizes.

"It is slightly adhesive to the touch. When dried at a common temperature, it gradually hardens, entirely losing its

adhesiveness, and is easily broken. It is soluble in essential oils, the solution having a milky appearance; insoluble in absolute alcohol and cold water; immersed in boiling water it softens and becomes extremely glutinous. It burns in the open air with a bright smoky flame, and when heated, it fuses and remains more or less viscid. It is entirely soluble in washed ether, from a solution of which it is precipitated by alcohol.

"The juice of the Sapota tree, (as well as the concrete juices of several plants containing Caoutchouc which I have analyzed lately,) differs from the Gutta Percha in its most important property. The action of boiling water on all those I have examined, softens the mass, but it renders it at the same time so extremely adhesive, as to obviate the possibility of rolling it out, or forming it into any shape whatever. The mass remains in this viscid state for sometime, when it hardens and becomes friable. The Gutta Percha, on the contrary, acquires no adhesiveness by the action of boiling water, and immediately on exposure to a cooler temperature, it regains its original toughness and flexibility."—*J. G. Scott.*

The valuable properties of Sapoteæ are many: it is known for producing much esteemed fruits,* good timber, useful gum, for affording a vegetable oil or butter, an ardent spirit and febrifuge medicine; the flowers in addition are used as an article of food.

But the main characteristic, and that with which we have most concern, is its milky juice. And although thus far the Gutta Percha tree agrees with the general character, yet its juice differs very remarkably by the absence of adhesiveness, to which peculiarity indeed it owes its value. This promises to be considerable; for a vegetable product which

* Lindl. Intr. Nat. Ord. p. 226. Royle Illust. p. 263. Voigt, Hort. Suburb. Calc. p. 340.

is softened by hot-water, while at the same time, it is capable of being moulded into any shape, that afterwards hardens, (in which state it is not acted on by a hot or moist climate,) so as to be preferred to horn for the handles of axes, is capable of extensive application.

Report of Proceedings regarding the inspection of Lands best suited for the cultivation of Cotton in the District of Dacca. By J. O. PRICE, *Esq.*

(Communicated by the Government of Bengal.)

To the Honorary Secretary to the Agricultural and Horticultural Society.

SIR,—In continuation of my letter, No. 610, dated the 18th July last, I am directed to forward, for the Society's use, a copy of Mr. Price's reports up to the month of August last.

I am, &c.

C. BEADON,

Under-Secretary to the Govt. of Bengal.

Fort William, 16*th October,* 1844.

To F. J. HALLIDAY, *Esq. Secretary to the Bengal Government, General Department.*

SIR,—I have the honor to submit to you, for the information of the Honorable W. W. Bird, Governor-General of India, the monthly report of my proceedings for the month of June.

2nd. In the early part of this month, I received three packages of acclimated New Orleans cotton seed, immediately after which I proceeded to the district of Dumroy, at which place I had sometime ago promised some ryotts a small quantity of the American seed as soon as it arrived here, and also to point out to them the manner in which they should cultivate it, which promise I went there for the

purpose of fulfilling; from thence I returned to Dacca, after being detained for some days by high winds on the river Bunsee.

3d. Some days after my return to Dacca, I had the honor of receiving your official letter of the 6th instant, after replying to which I again left this place and proceeded to Sonergong, to which place I went for the same purpose that I had gone to Dumroy, also to examine some young cotton that a ryott had planted there early in the month of May; but having mixed it with a crop called teel, I am afraid it will not do much, although the seed vegetated well; this is their usual mode of farming, and I find the ryotts are very hard to persuade that they would gain more by planting their cotton crop separate from their other crops, which I am quite convinced they would do.

4th. I have much pleasure in informing you, that I do not anticipate that there will be any trouble in renting lands on the river Banar for the Government experimental cotton farm, and at a cheap rate. This is the only way land can be got in this district, as the lands in every part of it I have been, are in the hands of Zemindars, and those to whom the lands belong in the districts of Toke and Cappasia, are particularly favourable to the Government experiment, in which I have the honour of being employed.

I remain, &c.

Dacca, 30th June, 1844. (Signed) J. O. Price.

Sir,—I have the honor to submit to you for the information of the Honorable the Deputy Governor of Bengal, the monthly report of my proceedings for the month of July.

2nd. Early in this month, I proceeded up the river Banar, for the purpose of inspecting the interior of the country on either side of that stream; namely, that of Cappasia on the right side of the river, and that of Toke district on the left. This further examination of that district of country strength-

ens much, my former opinion, that it is the most favorable locality in this district for cotton cultivation, and particularly adapted for an experimental farm for several reasons; in the first place any quantity of land required can be got with very little trouble, and the variety of kinds of soil that can be obtained in the extent of a moderate-sized farm in that district, will afford an ample opportunity of planting at different seasons of the year, so as to judge safely not only of the soil in this district best suited for the growth of the cotton plant, but also of the season of the year best suited for the cultivation of the cotton plant.

3d. During the remainder of this month, I have been busily engaged examining the interior of Bowal Purgunnah, which the present high inundation has enabled me to do by water; this I was prevented from doing on my arrival in this district, the rivers having fallen considerably before I reached Dacca in October last; but I have not seen any place so well suited for the Government experiment in cotton cultivation as the districts of Toke and Capassia.

4th. In the early part of this month, I sent a box of acclimated New Orleans cotton seed to Tipperah to have it planted on the hills. The natives there grow a considerable quantity of a coarse kind of *Cupas*, but I am in hopes, that a change of seed, as also that of cultivation, will improve the staple of the cotton of that district. I have also given seed to a number of persons who are anxious to try exotic cotton seed on their lands, and as their attention will not be taken up for a length of time with their indigo cultivation, I am in hopes they will give it a fair trial.

5th. I hope soon to have the honor of being authorized by Government to commence establishing the Government experimental cotton farm in this district, as it will take some time to erect huts for coolies, &c., and also to prepare the land for receiving the seed. I am, &c.

(Signed) J. O. PRICE.

Dacca, 1*st August*, 1844.

To J. DUNBAR, *Esq. Commissioner of the Dacca Division.*

SIR,—I have the honor to submit to you for the information of the Honorable the Deputy Governor of Bengal, the monthly report of my proceedings for the month of August.

2nd. On the 4th instant, I visited the neighbourhood of Foolbariah on the Dullasary, for the purpose of examining a patch of cotton I have at that place, and which I mentioned in my report for the month of May had suffered very much from the gale on the 22d and 23d of that month, but with additional care has quite recovered again, now bearing bowls for the second time. From thence I went to a village named Karnoparah, at which place a ryott has some cotton seed planted that I gave him, and from his having taken more care of it than any native that I have yet given seed to, I found it looking very healthy; I next went to the district of Dumroy, but the person to whom I had given cotton seed there I found had left that neighbourhood; from that place I returned to Dacca, where I remained until J. Dunbar, Esq. Commissioner of the Dacca Division left for Sylhet, having been requested by him to remain in the vicinity of Dacca for a short time.

3d. On the 26th instant, I again visited Foolbariah, and I am happy in stating, that I found the plant grown from New Orleans seed bearing well, and some of the bowls already open, a few bowls of which I pulled and send to you; it has got a little bleached by being allowed to remain on the tree too long, and having got wet from rain, but the size of the bowl is good, one of which I send you to judge of, and the fibre of which is good and strong; but what I planted of the Bourbon seed is running too much to wood, and I am afraid will require to be checked by pruning, being at present seven feet high without having yet blossomed.

4th. I have much pleasure also in informing you, that some cotton seed I sent to Betal, which is situated on the Burumpooter river, is likely to turn out well; it is now about four feet high and in full blossom.

5th. Hoping that the farming implements, seed, &c. &c. may arrive in good time this season for October planting,

I have the honor of remaining, &c.

(Signed) J. O. PRICE.

Dacca, 1st September, 1844.

The Sugar Planter's Companion.

BY L. WRAY.

[Continued from page 118.]

On Molasses, &c. &c.

The quality and value of the molasses which drains from the curing vessels, very necessarily depends on the description of sugar from which it is separated, and the methods used in effecting that separation. If the sugar is boiled at once from cane juice, and allowed to drain off its molasses, without any auxiliary aid, it is then what may be correctly called, true molasses, and is decidedly the very best description for the purposes of distillation; but when sèwah, clay, or other moist substances have been applied to disengage it, a great portion of the already crystallized particles becomes dissolved, and also drains off. This may then be termed molasses syrup, as containing a large quantity of the crystalline syrup, and each repetition of the process increases the richness of syrup, whilst the molasses in combination is very small indeed. The quality of the molasses is altogether dependent on the state of the cane juice, from which the sugar is boiled, and in re-boiling the molasses, this is very particularly noticed. To re-boil molasses is very uncommon in the West Indies, as the high price of their rum,

and the slight trouble distillation gives, perhaps more than counterbalances the greatest good to be expected from this second concentration. Circumstances may alter this in India, for instance, the greater cheapness of labour and fuel here, and the low price of East India spirit, in comparison with that of the West Indies. In Jamaica, the young planter who could not make a gallon of strong rum for every gallon of molasses supplied him, was considered unfit to have charge of a "still-house;" whilst with rich molasses and plenty of refuse from the boiling-house, from 1¼ gallon to 1½ gallon of rum, was very frequently the proportion. This handsome return, with the high rates obtainable for this favorite rum in the markets, rendered it next to folly to attempt the expensive process of re-concentration with its very doubtful results. In India, the general *argument* is very different, and the legal difficulties under which a distillery labours, and which I shall notice in its proper place, are strongly urged as an objection.

Here then, the practice of re-boiling the molasses, is general, although I will not say it is advisable; as far as I have witnessed, sufficient care is not taken to secure it against fermentation, which commences very early, and by which a very great portion of its crystallizable matter is destroyed, the whole body much decomposed, and consequently deteriorated, whether intended for re-boiling or distillation. To prevent this fermentation is very easy, for whether the curing vessels used, are cases, cones, nauds or casks, the receptacles placed beneath them could have a slight muting with sulphur or vapour of sulphur, so as to preserve the molasses until they were removed to the boilers, or discharged into the large molasses receiver, where a further application could be had recourse to, if found necessary.

By this method, molasses could be shipped from the Upper Provinces to Calcutta, and from thence to Europe, without undergoing any prejudicial change.

That molasses which drains from sugar, unassisted by and unmixed with water, such as proceeds from clay, sèwah and other applications used in curing, will keep a long time without fermenting, in comparison with that, so mixed; and therefore it is, that from sugar treated with sèwah, molasses drains, which is often in a high state of fermentation long before it reaches even the molasses receiver. I have seen it in the receiver frothing up, a foot or more, and this continuing for days, whereas, nothing can be more easy than to arrest the process, or even to prevent it in the first instance; but it is astonishing how indifferent and careless people are, even to their own interest, when the appliance, however simple, is a little out of their common jog-trot practice.

"Oh! it's such trouble and bother, besides we can't lose very much," is an answer I once had returned me; and although not always expressed, it is by far too general a feeling. Every planter should bear in mind, that he has active, careful and economical competitors to struggle with, and that it behoves *him* to be cautious, prudent, and strictly economical; that every slight saving is a decided gain, and every well advised precaution, a safeguard and security.

That which is often designated a trifling waste, generally proves in the end a serious loss, and the case above-mentioned forms no exception. One complains "I have boiled my molasses, but have got a very poor return indeed, of dark coloured '*doomah.*'"* Another, "It's no use trying to make rum here, I have used all my molasses and have obtained a *spirit*, but no more like rum than chalk is like cheese." Yet they do not for a moment consider, that they have themselves greatly to blame for such failures, as had they used common prudence, and the smallest exertion, their molasses would have escaped the injury effected on it by fermentation.

In a curing house, I consider this care of the molasses to be of much importance, especially, as I said before, in

* Inferior sugar obtained from molasses re-boiled.

India, where the molasses is bad and mixed with water, and other matters of an injurious tendency; I have therefore given it a prominent notice, and would press it on the attention of my brother planters.

For reboiling molasses, the wide, shallow, sheet iron pans used by the natives, answer the purpose very well, and are cheap, light, and boil quickly. I found that the following mode of treatment produced better returns, and fairer sugar, than any other that I tried :—

The molasses (presumed to be good) I first diluted very considerably with water, in which a small quantity of alum had been dissolved, then put it into the first pan or clarifier, and applied a gentle heat. As it became warm, I gradually introduced a lye made from stone lime, milk, and water, until, as the heat increased to a gentle simmer, a number of small flakes were seen in the liquor, which shortly became general throughout, and of a larger size. I then emptied the contents of the clarifier very gently into strainers placed one above the other, until the lowermost or finest (cloth),* delivered it into the concentrating pan; where, if *necessary*, a little more plain lime water was added from time to time until the process was completed, and the skip struck. It was then received into a large gumlah and kept moved about until symptoms of granulation appeared, when it was transferred to small shallow nauds, and left to itself until quite cold and granulated throughout, the plugs were then removed, and drainage allowed for the space of six or eight days, after which light claying, two or three times repeated, brought it to its most perfect state.

Claying cannot be had recourse to with prudence under the time stated, as the grains take long to form in sufficient strength to resist the action of moisture; nor must the clay be too wet, or great loss ensues to the very weak crystals; as is well known to every native refiner. This inferior sugar or "*doomah*", is not by any means a productive article

* This filtration takes some considerable time to compelete.

for refining, and had always better be mixed with other strong-grained sugars, and if possible, boiled in vacuô. It is a common practice with native sugar manufacturers up-country, to mix their whitened *doomah* with their first quality sugars, and thus very much deteriorate their value.

From this arises the anxiety of sugar dealers to purchase their fine sugars as early in the season as possible, before the manufacturers have time to reboil their molasses and effect the mixture. On a sugar estate in India, reboiling molasses may be carried on in a tiled shed adjoining the boiling or curing house, and the shallow pans can very well be hung over furnaces constructed with well-made kutcha bricks (sun-dried,) cemented with good (clay) mud. After this simple, but very general, furnace is perfectly dry, the fire applied to the pans burns the bricks and mud-mortar perfectly hard, and renders the whole strong and lasting. The fuel and attendance together with the larger curing house required, would form the chief items of expence, and it remains to prove by practical demonstration, whether reboiling one's molasses is more remunerating than converting it into rum. This I shall now proceed to argue from known results and my own experience, premising always, that the description under consideration, is that which I before particularized as *pure molasses*, or the first drainings from sugar boiled direct from cane juice, &c. &c. I will take an estate in India, making say 500 tons of sugar, or Calcutta maunds 13,500, and giving 8,500 maunds of molasses, which being reboiled, yields at 15 per cent. 1,375 maunds of inferior sugar or *doomah*, and 6,670 maunds inferior molasses, allowing for waste. The account would then be as follows :—

1375 Calcutta maunds of inferior sugar or *doomah*, @ 5 Rs. ... ... Rs.	6875
6670 Ditto ditto of inferior molasses, @ 8 Ans. ...	3335
Total, Rs.	10,210

This I consider as fair an allowance, both in quantity and price for both, as can reasonably be hoped for, but from this sum we must consider that the manufacturing charges have to be deducted, whilst cost of extra erection may be placed to block of concern. Against this, let us take the above-mentioned 8,500 Calcutta maunds of molasses to the distil house, where with the scummings from boiling-house and other refuse, a return of superior flavored rum may be expected, at the rate of *five imperial gallons 20 per cent. over proof* to every maund of molasses, or a total of 42,500 imperial gallons 20 per cent. over proof, valued at 8 Ans. Rs. 21,250. Having the advantage of the boiling-house stuff, and the molasses being pure and fresh, this rum would naturally be far superior to the common East Indian rum at present made, and the price mentioned is therefore exceedingly low,* whereas the average return of 5 gallons per maund, is grounded not only on my own ideas, but justified by the results during the last four years of a distillery in this country, conducted by a West India planter of 25 years' experience.

I know that the expence of establishing a distillery and the heavy deposit to Government, is what militates so much against it in India; but when I enter on the subject of distillation, I shall treat more at large on the merits of the case. The next kind of molasses, is that, I have before called molasses syrup, as resulting from sugars treated with sèwah, clay, &c. &c., and which although much mixed with water from these, yet abounds much more with crystallizable syrup than with molasses, and is consequently richer and more easily concentrated. It is not advisable to mix this quality with the foregoing, but rather with the syrup obtained by the subsequent applications of clay, &c., and boil down into fine sugar, which with a little care it will always yield. The sugar from which these repeated drainings are supposed to come, I class as fine clayed sugars fit for the home market; and of course the more perfect the canes are, the

* It might be estimated, with great safety at 1 rupee per gallon.

more rich will be the juice, and the less trouble will it give in curing. One magma of clay will answer with some qualities, whilst others may require two or three repetitions, and the syrup drainings will of course be in proportion.

Many persons prefer shipping their molasses to England, and according to quality the prices range, for Jamaica, from 17 shillings to 28 shillings per cwt.; for Bengal, from 12 shillings to 18 shillings per cwt. Now with good molasses at 18 shillings per cwt., it is almost a query whether it is not just as well to ship as to reboil or distil, unless a larger proportion of *doomah* can be obtained, or the price of good East Indian rum attain to something like 3 shillings or 3*s.* 6*d.* per gallon, 20 over proof. The molasses shipped from India is usually of a very inferior quality to that of the West Indies, as the difference of price evidences; but were care to be taken by planters manufacturing their own produce, I see no reason why that difference should not cease to exist, and their shipments realize highly remunerative rates. As I before remarked, molasses may be preserved from fermenting, by burning a few sulphur matches in the destined receptacle, and on transferring it to casks for shipment, a further muting may be advisable, which would assuredly preserve it from all risk of fermentation taking place during the passage home. To planters of small means, and new beginners, this method of disposing of their molasses offers many temptations, and in my opinion is more to be relied on than the present system of reboiling.

In the West India Islands, this reboiling has recently engaged the very serious attention of their Agricultural Societies, but I think I shall be able to shew as I proceed, that their present distressing situation, rather than the real merits of the suggestion, has induced them to entertain it; they are truly in the position of drowning men, and in their desperate efforts to maintain themselves, catch at straws and fantasies. Amongst the many useful suggestions which they undoubtedly have al-

ready supplied, (and will yet continue to bring forth, as their severe necessities sharpen their inventive faculties,) there can be little doubt that some few errors of judgment will occur, and tempting fallacies obtain a temporary advocacy; but like the subject of present remark, sad experience will in the end prove the frailty of the reed on which they rest.

CHAPTER IV.

On the Distillation of Rum in all its branches, colouring and imparting a good flavour, &c. &c. &c.

It has been truly said that nothing is (ought to be) lost of the cane on a sugar estate, and when we notice its progress from the field through the mill, boiling and curing houses, until its juice is transformed into sugar, (by the aid of its own trash used as fuel,) and its molasses, and every particle of refuse, in the distil-house, are collected, economized and converted into rum, leaving absolutely nothing, from which anything can be extracted, or turned to account; even to the making of manure for the next crop; when we mark all this, we cannot but be struck with the singular value of this plant, and the excellent adaption of all the working details on an estate, in this, its double manufacture.

But it is the *still-house*, where its very *essentials* are *literally* formed of the scum and refuse of the other manufactory, and which notwithstanding yields, at a small cost, so rich a return, as on *some* estates, in the olden time, to have paid the expenses of the season, leaving the crop of sugar as clear profit.

It is very certain, that this could happen but seldom: but that it should happen at all, shews in an astonishing manner the great value of a distil-house to an estate: and it may readily be inferred that no West Indian Estate was without one. Amongst all the famous West Indian rums, that of

Jamaica always has been, and still is, the most celebrated, and consequently commands the very highest price in the markets of the world: yet few imagine the very great difference that exists in the quality of Jamaica rums. One estate, with the same apparatus, advantages and skilful management as its immediate neighbour, half a mile distant, makes quite a different quality rum, perhaps better or worse, whilst the north and south sides of the island produce a spirit *totally* unlike; the former being infinitely superior. In India it is common to hear people express their surprise at their wretched molasses spirit (which they call rum) not equalling the rum of the West Indies, whereas the idea is as absurd, as the expectation of effecting an impossibility can make it. Let us consider what are the materials used in a West India still-house, and compare them with that of the East. First then we have the fine fresh skimmings of the cane liquor from the boilers, the scum, and precipitates from the clarifiers, and the rich, fresh and unadulterated molasses from the curing house, which after the first day's distillation are strengthened and enriched by the addition of the light, clear dunder (or redundár,*) which the still contributes in the form of wash, from which the spirit has been extracted.

These "set up" in well ascertained proportions, with every advantage of a dry, warm, well appointed fermenting house and skilful management, are the common necessaries of a West India Still-house. In India, the common, fermented, sour, and trebly adulterated draining from *doomah*, or from date sugar, known by the name of molasses, forms the *sole* material in the first "setting up," which is afterwards somewhat assisted by its own very inferior dunder. In some of the large sugar refineries conducted by Europeans, the treacle is certainly of a better description, but bears not the

* A Spanish word, literally signifying, to redound, to contribute.

slightest similitude to pure molasses. In refineries working from cane stuff alone, much might also be gained from the refuse of the *khar* and *goor*, which would be available for still-house use, in setting up liquor, but I know of no refinery that does not use date *khar* very extensively, and thereby much prejudice their treacle for distilling purposes. Excellent distillery men, old West India planters, are in the country, who have erected distilleries, and done all that skill and good management can accomplish to improve the quality of the spirit, and *have* exceedingly improved it; but to these I may address those well known lines, in "*Lewis's*" elegant translation :—

> "Alas! dear Sirs, you try in vain,
> Impossibilities to gain;
> No bee from Corsica's rank juice,
> Hyblæan honey can produce."

Nor can these gentlemen *ever* succeed with such materials in making other than a common "treacle spirit," which parties may call "molasses spirit" if they please, but to dignify by the name of "*rum*," is a wilful absurdity.

As sugar estates conducted by Europeans become more common in the country, so may we expect to find an improvement in this branch, and I do not think that any one embarking in a sugar cane cultivation should be in any way discouraged from adding a distillery to his works on the score of East Indian spirit obtaining bad and unremunerative prices; for if my brother planters will only consider the undeniable truth contained in the foregoing remarks, they must see, that it would be out of the question to apply those low prices to that superior description of spirit, which it would be in their power to make, and which might most justly be titled "*rum.*"

Their's would be the pure, unadulterated rich molasses with the boiler skimmings, and other stuff, the same as used in the West, and if they did not make a good rum, it would be

their own fault, and not chargeable on lack of good material. Why then with every requisite should they not make good, strong, and well flavoured rum in the East Indies, and why should not such rum obtain a respectable price in the home market?

The home dealers are experienced men, and quick at detecting a superior article; they would assuredly no more let such improved flavour escape their notice, than they would refuse to pay an increased price for it; both are as reasonable as they are certain, and as certain as reasonable. In a very short space of time a name would be established, which would be another material advantage, and as the rum was permitted to attain age, and gain the additional excellence resulting therefrom, the rivalry betwixt East and West, would yet more nearly approximate.

Estates are now springing up in abundance in India, Penang, Province Wellesley, Ceylon and other adjacent places, whose proprietors or managers may find an interest in having a plain exposition of facts laid before them, ere they decide on adding a distil-house to their Estates, and I shall therefore enter on this enquiry with all brevity and conciseness. According to late accounts received from the West Indies, I find that in the Agricultural reports there is an increase of 30 per cent. expected from their molasses, which is to be re-boiled, and all the sugar extracted previous to being sent into the distil-house, but whether this large proportion can in practice be realized, is most doubtful, and it has yet to be proved how far such a proceeding would be profitable.

A Jamaica estate making 500 tons of sugar, would give something like 40,000 gallons of pure molasses, or 40,000 gallons of rum; which in the home market, would most probably fetch 4 shillings a gallon, or 8,000*l.*, from which manufacturing charges, freight, &c., would have to be deducted, say something considerably below 1,000*l.* for all costs.

To re-boil these 40,000 gallons, even allowing for argument sake, that 30 per cent. *was* obtained, the out-turn of inferior sugar would be 12,000 gallons, or something like 652 cwt. which at 26 shillings per cwt. in bond, would yield 815*l.*, leaving manufacturing charges, freight, &c. &c. to be deducted. To this 815*l.* gross, may be added the value of the inferior or second quality molasses, or treacle, which in quantity may be (allowing the low rate of 5 per cent. for waste,) about 16,600 gallons for sale or distillation, and in value say equal to making 12,450 gallons inferior rum, which under the same circumstances, would fetch 2*s.* 6*d.* a gallon,* or something like 1,606*l.* exclusive of manufacturing charges, freight, &c. &c. I will not add more to this comparative shewing, for it seems to me to carry, on the very face of it, a decided answer to the question of re-boiling in the West Indies. But many will say that 4*s.* is a very high price, calculating as I have done, but I can assure those persons, that I have often seen rum, of only a few months' old, sell in Kingston, Jamaica, (by the puncheon) at from 4*s.* to 6*s.* per gallon to the retailers, who on their own account, pay Government a sum of something like 30*l.* sterling per annum† for their license to sell. The tax on the manufacturer is very light for rum they sell in the island; the license tax making up a large revenue.

Sugar estates in India are supposed to have every requisite for making a well-flavoured rum, as well as their rivals of the West, and it rests then to consider how far the above remarks are alike applicable.

In establishing a distillery here, application must be made to the authorities for permission so to do, and this is usually granted, on the superintendent and proprietor entering into a joint bond to abide by certain rules and regulations, imposed by the Board of Customs, and depositing the sum of

* Perhaps 3*s.* might be obtained.

† This licence tax I state on memory.

rupees 5,000 as security against infringement; besides this, the distillery is subject to the strictest *surveillance* of the Custom House Peons, two of whom are located on the premises, and watch every drop of spirit that is delivered from the still. Periodical visits are also made by the Darogah to inquire into the state of things, and enable him to make his report. Once a week his presence may be expected, and through him orders are obtained, from the higher authorities, to ship, or otherwise dispose of the spirit on the premises, as without this official permit, not an *iota* can leave the distillery; nor is a less quantity than one thousand gallons allowed to pass at a time, and even *that* is seizable if found to be under proof. In and about Calcutta the salaries of these Custom House Peons are defrayed by Government, the distiller having to provide them with a house only; but in the country the establishment has to find houses for, and pay salaries to, not only the two peons at 8 rupees each, but the Darogah also at 16 rupees per mensem, making 32 rupees a month for being watched. Of course, sugar estates would have to submit to this latter expense, if contemplating the maintenance of a distillery; and although a statement of these rules is strictly called for here, yet an enquiry into their wisdom, or the immaculate honesty of the subordinate officers employed, forms no part of my object in this work.

The deposit of rupees 5,000 sounds very harshly on the imagination of an intending distiller; but when we consider that this sum may be in "*Company's paper*" *bearing interest*, a great portion of that feeling becomes reconcilable, especially if the rate be high.

These are the real legal disadvantages under which a distillery labours in India, to which may be added the fact, that the spirit, however bad it may be, cannot be re-distilled unless a requisition be sent in to that effect, and permission granted; the deficiency is *then* allowed to credit.

With the foregoing brief remarks, I will now proceed to explain the working details; and although I shall be happy if I can suggest anything useful to those engaged in distillation alone, yet my observations are more particularly directed to the guidance of planters in management of sugar estates, who have the means at their disposal of working on the whole of the usual material.

The *erection* of the distillery is the primary object, and to combine every thing that is simple and economical with that which is most efficient and lasting, is what is demanded by the planter in the out-set. Years of experience and probable loss in his own proper person, will only bring him in the end to the same point at which he may at once arrive by availing himself of the well-tried experience of others. Grievous loss and lasting disgust have often been entailed by an exhibition of wilful obstinacy in this particular, and I would therefore strongly urge the importance of commencing on a general principle and detailed arrangement, which can be justified by the successful practice of many years.

By following this line of conduct, we may expect to do well of a *surety*, whilst speculative theorists succeed by *chance;* I therefore recommend to my brother planters nothing but what has my own practical experience to confirm it. The distil-house, as I before laid down, should be *warm, light and dry.* The fermenting vessels, *cisterns* sunk in the ground, and the distilling apparatus, a common still and double retorts. I may perhaps mention a simple though material addition to this latter; but as it does not alter the principle or general arrangement, I will leave it until I advance a little deeper into my subject.

At the commencement of crop, the skimmings from the boilers and the precipitates, with the washings of the clarifiers flow along the skimmings gutter* into the still-house, and are received in the first vessel, termed the skimmings re-

* See Plate iv. in Vol. ii.

ceiver, (as shewn in Plate 2,) where it* accumulates until nearly full, when it is turned off into the next empty one; the full one being allowed time to settle and clarify itself. When this is found to be perfected, it is drawn down into one of the fermenting cisterns, and the first molasses that can be obtained from the hogshead first potted, is immediately added to it, and preserves *it*, and the succeeding additions of skimmings for some days (until sufficient molasses has been realized, to commence setting up a few cisterns.) At the beginning of crop, (should no old *dunder* be on hand from last year,) the cisterns are cold, and what is termed, out of season, and consequently take sometime in settling a fermentation, for which reason, it is a common practice to put a quantity of cane trash into the empty cistern and set it on fire, whereby the cistern is slightly heated, whilst others put hot-water in, to induce a more early fermentation.†

Old customs are sometimes very well, and this, anent hot-water, is not a bad one, where the house is cold; but the fact is, the cisterns are out of season, which is, their wood is not so tainted as to affect the new year's liquor, and bring on a speedy fermentation. However, the second setting up does away with this want, and the cisterns are then termed, seasoned for crop. A portion of *dunder* saved from the last crop, instead of being thrown away, materially assists in bringing on a fermentation, and at the same time adds much to the flavour of the rum.

Crop commencing Monday morning at 5 o'clock A. M. would have the boiling-house at work by 7, and fire called to the boilers by 9 or 10 o'clock A. M., and would consequently have next morning (with a powerful mill and two sets of boilers) 3 or 4 hogsheads or tons of new sugar to pot, which

* The mixture.

† The hot skimmings are a great assistance in heating them, but sometimes filling the cisterns with green trash from the mill yard is a good plan, as it speedily begins to sweet and steam, warming the cisterns thoroughly, they are then very slightly limed, and filled with wash.

would in 24 hours have given a sufficient quantity of molasses to preserve the skimmings sent into the still-house from spoiling.

But if the skimmings should betray symptoms of acidity previous to the curing-house supplying any molasses, a little lime may safely be applied to arrest fermentation, or vapour of sulphur may perhaps be more advisable, as being less injurious and more effective, besides it will not require any molasses to be added. If an abundance of skimmings accumulates on you, take a few old puncheons or hogsheads, and draw it down into them, taking care to burn a few sulphur matches in them immediately before filling each cask, and their contents will thus be preserved until molasses sufficient has drained to commence setting up cisterns. This is the first step; viz. to preserve the first skimmings until molasses is ready to set up with. Immediately the supply of this latter warrants draw down into the fermenting cistern, *direct*,* the quantity of skimmings your stock will afford, and add molasses and water according to a fixed per centage. Thus the first duty of a still-house superintendent is to discover what rate per cent. yields best in the house under his management: this is done by setting up different marked cisterns at different rates per cent. of sweets; viz. molasses and skimmings, and by keeping a memo. of their time, rates and return in spirit, to judge which affords the best return, in point of time, sweets and fuel consumed. This is easily ascertained, and when once settled by an experienced hand, continues perhaps for years on the same standard. For instance, say on an estate, I found 10 per cent. molasses with 20 per cent. skimmings answer best. I would expect to see an entry in "distil-house book," to something like the effect shewn in the annexed account of weekly work done on an estate making 500 tons per annum.

* If sulphur is used, the skimmings will require to be slightly heated to get rid of the sulphur, which would otherwise prevent fermentation.

(Say) *Distil-house Book for ——— Estate, Crop 1844.*

JAMAICA.

Days of Week.	Date.	Molasses on hand.	Skimmings received.	Molasses used.	Skimmings used.	Dunder used.	Water used.	Total galls. wash per diem.	Cisterns set up.	Rate per cent. sweets.	Cisterns run off.	Rum produced.	Over Proof.	Rum on Estate. Punch.	Rum on Estate. Galls.	Used on Estate and ullage.	Sent to Wharf.	Remarks.
		Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls. 2,000			Galls.	Pc.					
Monday, ...	1st,	200	1,000	400	800	1,800	1,000	4,000	2	12	1½	350	25	..	..	..	..	Ten per cent Molasses and 2 do. do. Skimmings=12.
Tuesday, ..	2nd,	100	1,000	360	1,200	1,800	640	4,000	2	12	1½	350	25	..	..	..	..	
Wednesday, ..	3rd,	100	800	160	800	700	340	2,000	1	12	2	400	30	As this may happen.				From 4 A. M. to 10 this night.
Thursday, ..	4th,	..	1,000	400	800	1,800	1,000	4,000	2	12	1½	320	20	..	..	..	..	From 5 A. M. to ½ past 8 P. M.
Friday, ..	5th,	100	800	160	800	800	240	2,000	1	12	1½	320	20	..	..	..	..	Ditto, do. do. do. do.
Saturday, ..	6th,	..	1,400	360	1,200	1,800	640	4,000	2	12	1	230	25	..	..	..	..	Saturday night washing down in boiling-house; *proceeds* preserved until Monday morning.
Week's Total,	Work.	..	6,000	1,840	5,600	8,700	3,860	20,000	10	12	9	1,970	..	..	..	..	..	

MEMO.—19 Puncheons and 70 Gallons Rum made this week, and 20,000 Gallons Wash on hand, with 400 Gallons of Skimmings and Boiler Washings, &c. &c.

I do not aim, in that weekly work, to shew more than what is *likely*, for circumstances may so much alter the whole material employed, as to call for a corresponding alteration in the proportions. I estimate good average skimmings received in still-house to be in comparison to molasses as ten to one: one gallon of molasses being about equal to ten gallons of good average skimmings. Porter and Fitzmaurice, estimate it at *five* and *six*, and Roughley at eight to one: but I am persuaded that the average of a crop would more nearly approach *ten*, which I therefore take as my rule in "setting up." Immediately the skimmings receiver has had time to clarify its contents, the cock is turned, and the liquor runs off quite clear and luke-warm (generally,) into the fermenting cistern; next the quantum of molasses is discharged from molasses receiver, also by gutter, then the clear *dunder*, and lastly the water, which should be soft and pure.

The cisterns being built square, as mentioned before, a measuring rod or staff, say eight feet long, two inches broad and half an inch thick, should be provided, and the exact depth of the cistern taken on it, and this marked off again (if a thousand gallon cistern) into ten deep lines denoting hundreds, and betwixt these by lighter ones denoting tens; each line having in its centre a slight perforation to admit of a small nail being stuck in for a mark. In this manner drawing down your skimmings you place the nail at the second large line, and direct the stillerman to stop the cock as soon as that quantity, viz. 200 gallons, has been delivered; then for the molasses put another nail at the next deep line, which hundred gallons is given the same way; next for *dunder*, the bottom nail is moved up to the desired quantity, say 500 gallons more, and lastly the remaining 200 gallons is filled up with water. By this method the European superintendent has only to mark the different stages with the nails, successively, for the workman to understand perfectly how much of each he is to give.

If the skimmings abound, and can therefore be afforded, 300 gallons will be desirable, with 90 gallons of molasses, 400 gallons *dunder*, and 210 gallons water, in setting up a thousand gallon cistern, or tun. Some still-houses work best at 10 per cent. sweets, others at 12, whilst others again range from 14 to 15 per cent., therefore as I said before, experience must teach this: however, my own idea is, that for India 12 per cent. molasses, and 20 per cent. skimmings (or 14 per cent. sweets in toto), is the best proportion a new beginner can commence on in practice; always bearing in mind that the first round of the still-house at the beginning of crop, requires to be set rather lighter, as the cisterns are cold and out of season; but after that, the rate can be increased to the desired standard, and the house will soon exhibit its capabilities and requirements. Cleanliness in a still-house is one of the chief *necessaries*, for without that, an acid taint gets in, and ruins everything; then come anxiety and loss, every vessel must be emptied, scoured out and doubly white-limed, until the whole, from skimmings gutter to still, are thoroughly cleansed and the taint eradicated.

A fresh start must be made, and all old *dunder* rejected; in fact, it is a most annoying and vexatious occurrence, which can only be chargeable to gross neglect and bad management. The gutter from boiling-house, should be washed thoroughly every night, and white-washed with lime water; the skimmings receivers, well washed and scrubbed every time they are emptied, the cisterns also, with all moveable gutters, pumps, &c. &c. Too much care cannot be taken, and this must also extend to the molasses and *dunder;* one drop of rain or other water must not be suffered to mix with them, until they reach the fermenting cisterns, otherwise they are sure to be much injured.

The question of *dunder* being conducive to the good flavour of rum, has often been discussed, and many old authorities even say, that it injures the flavour, though it in-

creases the quantity of the spirit.* To this opinion I cannot subscribe, in fact I believe it to be totally incorrect, and opposed to every-day experience. In Trelawny and other parishes on the north side of the island of Jamaica, the very finest flavoured rum is made, and although this may and does arise from more than *one* cause, yet to my own certain knowledge, the planters there use a far larger proportion of *dunder* in setting up their wash, than is common on the south side. Having myself been a planter for some years on the south side, I afterwards was appointed to an estate on the north side, and remember well how surprised I was at finding so much *dunder* used in setting up wash, and how it, at first, shocked my ideas of still-house management; but I quickly found that my former notion was quite erroneous, *and that if the dunder was good and light, there was no necessity for using any water whatever in setting up a cistern.* Water becomes necessary when the *dunder* is dark and heavy, otherwise the liquor will work too sluggishly in the cisterns, and take too long a time to "*die.*" These distinctions are apparent to *practical* men at first sight, and *here* it is indeed where practice avails, the entire *absence* of water, or a greater or less requirement, is indicated at once by the state of the materials, and the manner in which they behave whilst undergoing fermentation. This will be better understood when I explain, that sometimes a cistern will work so slowly or heavily (as it is termed,) as to take two, three, four, five, and sometimes even six weeks, before it becomes ready for the still; whereas from six to eight days is the usual, and proper time. If set up at a high per centage, ten days is not uncommon, and I think it not unlikely that the proportions I have named, as suitable to East Indian estate's-distilleries, may cause the cisterns to occupy that space of time.

* See Porter and Bryan Edwards.

I do not intend that a planter shall confine himself to my per centage, but if inexperienced, try *that first,* and in a few days after first returns are shewn, experimentalise on a few different per centages from *ten* upwards. From what I have before said it will be seen, how imperative this trial is, and moreover how necessary it is to attend to it oneself, instead of trusting irresponsible and careless subordinates.

The process of fermentation is one of the most singular instances of matter acting on matter, and by the aid of elementary influence changing each its character, until the transformation, effected by the general operation, places it in a position to accomplish after a season, yet *further* transformations, and thereby produce various new compounds.

That fermentation which takes place in a distillery, exhibits in a remarkable manner the metamorphosis that its various components undergo. I have it not in my power at present to furnish a correct analysis of good average wash; but in the scum and precipitates from clarifiers, skimmings from boilers and *dunder,* we have a number of bodies combined, whose peculiar action on each other, during the process of fermentation, is of a most interesting character.

From the resinous aromatic gum, resident in the rind of the cane,* the well known flavour of rum is generally understood to proceed: but this is very different when a spirit is manufactured from molasses alone, for *then,* although no trace can be discovered of this distinguishing aroma, yet a very plentiful impregnation of an empyreumatic oil is disagreeably perceptible. This is accounted for by the pernicious transformation effected on the resinous gum contained by the intense heat of the boilers, during its passage through them. In the skimmings this action has been but exceedingly partial in consequence of the comparatively very slight degree of heat it has been subject to.

* Volatile oil contained in plants is changed into resin by the absorption of oxygen. (See Leibig.)

Besides this essential oil of the cane, we have reason to believe, that a further accession is gained during the process of fermentation, from small pieces of the cellular tissue in the wash generating an essential oil as its decomposition takes place.* I have myself no doubt that such is the case, and a few simple reasons for my belief may suffice; for instance, in making rum with a very rich perfume of pine-apple, it is only necessary that we put the bare rind of the fruit into the fermenting cistern, and let it remain there until the process is completed: this is only that the rind in which the essential oil resides, shall as it decomposes impart to the wash its peculiar flavour, which it then does, abundantly and freely. This fermented wash, so impregnated, yields on distillation what is generally called "*Pine-apple rum.*"

Peach rum again, is made by placing the skins and kernels of the fruit, with the blossoms, into the fermenting wash, by which the essential oil is separated and becomes incorporated with the wash, by which its characteristic perfume is secured to the distilled spirit. Indeed this change of flavour may always be influenced at pleasure, and a good distiller knows well how to improve his crop in this manner, so as to command a very superior rate in the market, without having recourse to the various deleterious compounds which are used by less able, but more dishonest operators. In making use of the essential oil of foreign auxiliaries, it should be borne in mind, that the flavour is very fleeting, and in no way to be relied on, whereas that obtained from its *own* plant, the cane, is its *natural* aroma, and not so readily volatilized; therefore it is in my opinion, a good plan to have a small quantity of the cellular tissue of the cane thrown into each cistern set up.

In some canes this resinous gum (and essential oil generated on fermentation) more particularly abounds, and has a

* See Leibeg and Ure.

very pernicious effect on the sugar and rum made therefrom, the latter in such case must be peculiarly treated, as I will shew in its place.

When the cistern is set up in proper proportions, the wash must be well stirred up and left to ferment, taking care to skim off all the scum and dirt that rises during the process until in about eight or ten days the liquor will be fit to distil. It is then pumped into the still and the two retorts allowed a few gallons of low-wines; fire is placed, the still boils and the steam passing into the first retort, heats its contents, and then proceeds in like manner to the next or second retort, which, when fully heated, rises the spirit vapour through the escape pipe, which is joined to the worm in the condensing tank, and by it is conducted into the distil-house can-pit, where it is received into cans holding a fixed measure, (generally 5 gallons,) and transferred to the rum butts. The strength of the spirit ensuing, is tested either with the hydrometer, or the common proof bubbles (*or beads*), and as soon as it becomes too weak for the rum required to be shipped, it is then thrown into the low-wines' butt, until no more strength is perceptible in the running.

The quantity of low-wines obtained in this manner from a still with double retorts is very seldom more than sufficient to charge the retorts with next time; for instance, a still of 1000 gallons, and two retorts of about 80 and 70 gallons each, on the commencement of crop would require say 10 gallons of water* in the larger and 7 gallons in the smaller retort, and the still loaded with wash, the return from which, the first running, would perhaps be, say 100 gallons of rum 30 per cent. over-proof, and from 70 to 80 gallons of good low-wines. The second charging of the retorts would then be of low-wines, about 40 galls. into the larger and 30 into the smaller, and the still with wash, the return from which would

* Water is merely put in, as no low-wines are supposed to be on hand.

be most probably 120 or 130 gallons same proof as before, and continue thus (according to the strength of the wash) constantly.

It is a bad plan to put too much low-wines into the retorts, as it is liable to blow over the helm, or if it does not do so, it may materially injure the flavour of the rum in another manner; viz. by imparting to it a strong taste of low-wines, or more correctly speaking, an empyreumatic odour. The proportion therefore may more advantageously be taken perhaps at 35 gallons for the one, and 25 for the other; besides by this, only 60 gallons of low-wines will be required (or 12 cans) to be taken off, after the rum is finished, consequently the low-wines will be very superior, and will in the next running produce better flavoured rum. To understand this, it must be explained, that as the low-wines run off, each succeeding can is weaker, and more abounding in this empyreumatic oil, than the preceding one, and as it comes towards the end, the last can or two (though containing some little strength) are of such very bad quality, as to injure very much the flavour of the foregoing cans, and can therefore be well dispensed with.*

I have seen a still-house book-keeper working with such apparatus, improve on this plan, by placing wet cloths or swabs on the top of his second or smaller retort, and every now and then dashing them with cold water from the receiver, especially towards the middle of the rum running, when the spirit was getting weak, also with the low-wines. I consider it a very good plan, and one that might well be followed up, and better regulated, in the application of water to the second retort. In addition to the still and double retorts, a great improvement may be made by having a "charging condenser," otherwise called a "*wash heater*," attached. This should be placed betwixt the 2d retort and the condensing (water) cistern,

* Some people throw salt into the liquor about to be distilled, to improve the spirit.

and is nothing more than a long cylindrical vessel (either of copper or wood), which is three parts filled with wash, and through which the pipe from 2nd retort passes, on its way to the condensing cistern. The heat of the spirit vapour passing through this pipe, heats the wash in the "charger," and brings it, by the time the still is run off, to the boiling point; when the still being discharged and retorts reloaded, the heated wash is drawn down into the still, and the work proceeds. The charger is again loaded, and as the spirit distils over, and passes into the still-house, so does the wash again become heated, and arrives at the boiling point, by the time the still requires re-charging. Care must be taken that the wash in the charger does not become too much heated, or the vessel will burst, if not provided with an escape pipe: this latter is common in the West Indies, and is usually conducted through the condensing cistern into the still-house, where it delivers the spirit it has distilled over. But perhaps it will be found sufficient to bring the wash in the charger *just* to the boiling point, and *no further*, so that when the still requires re-charging, the boiling liquor is transferred into it, in all its strength.

To compass this, it is only requisite to determine the length of pipe which is to traverse the charger, and so regulate it, that the contents may just arrive at the boiling point as it is required. Never mind if it is even a degree below that, as it will be safer and make very little actual difference in time, &c.

This is very easily done, and it will be apparent, that by this system of wash-heating, much time and fuel are saved; and a still with double retorts which runs three times a day, with this improvement may run off five or six charges in the same time, and with much the same fuel. The charger should, as I stated above, be only three parts full to allow for expansion, and prevent accidents; although the escape pipe and loaded valve would always ensure safety, and at the same

time prevent the loss of any spirit vapour. A good stout cask, holding as much as would fill the still, and one-third more, (if unprovided with an escape pipe,) is all that is necessary; but if any apprehensions *should* exist, then let the cask be large enough to hold only 50 gallons more than the still, and in centre, place a copper pipe, (three inches in diameter,) which carry up at least five feet perpendicularly, and then downwards (two inches diameter,) through the condensing tank, into still-house, so that if any spirit distils over, it will be received in the can pit. In hanging the still over its furnace, a distance of 20 inches, between bars and still bottom, should be allowed, if *coal,* be used, or 30 inches if *wood:* the heated air and smoke from the furnace instead of going up the chimney direct, are conducted by a flue all round (the side of) the still, so as to give the still the benefit of all the heat possible.

A thousand gallon still and two retorts, *well hung* and furnished with a "*Charger,*" should run off six charges a day, making (with wash at 12 per cent.) say about 700 gallons of rum 30 per cent. over proof, in that time, cost of such apparatus may be estimated as follows:

New copper still and worm very best workmanship, ...	Rs.	4000
Two wooden retorts (white pine) with copper pipes *about,*	,,	200
Wooden charger with flanges and escape pipe, say, ...	,,	300
Whole apparatus Total,...	,,	4500

When all the strength of the wash has been distilled over, the fire damped, the steam plugs, or cocks of retorts are withdrawn or opened, and then the "*Man-door*" of still is taken off, and the spent wash (now called *dunder*) is drawn down into the dunder receiver: taking care to stir it up well

before it leaves the still, otherwise a great deal of dirt will be left at the bottom. The retorts are emptied of their contents, (now called *lees*) by turning the cocks, at bottom; which lees, are carefully conveyed off by a small gutter, as they are very corrosive, and cannot be made use of again. All this being effected, the still and retorts are reloaded, and the operation continues over and over again. The *dunder* from still is, as I before said, drawn down into *dunder* cisterns, situate *below* the level of the still, and after becoming partially cool, and settled, is pumped up into other receivers immediately above them, and there remain to cool perfectly, and clarify, until required in still-house for setting up wash anew. These *dunder* receivers are, always, to be under shelter, and by erecting them as described, (the upper exactly above the lower), one small shed will answer for both sets. Sometimes more *dunder* collects than can be contained in the *dunder* receivers, and it is then common to draw down a quantity of it, into any empty fermenting cistern in still house, until it is wanted to set up with. This more particularly happens when the *dunder* is of a fine, rich quality, and should there be a few empty cisterns available, it is divided amongst them, giving each first as much as will suffice to *set up* that cistern as soon as the other materials are ready.

Plenty of good light *dunder* should always be kept on hand, for very often, from a variety of circumstances, heavy, thick and bad *dunder* may result from still, which must be all thrown away, and not allowed to come into use again, on which occasions the good *dunder* that has been carefully husbanded, comes into service. It was a common practice of my own, and many other West India planters, to fill up all cisterns, one by one, towards the end of crop, by which plan the cisterns were kept *in season*, and prevented from leaking, whilst the old *dunder* came in admirably at the

commencing of the next crop, for the first round of the house. Using old *dunder* in this manner is perfectly safe and altogether advisable, but care must be taken not to give too large a quantity of it to each cistern, or the fermentation will be heavy and long in working off: therefore in a thousand gallon cistern, at starting, the proportion may be, molasses 60 gallons, skimmings 400 galls., *dunder* (old) 240 gallons and water 300 gallons which will work light, and quickly. As soon as *new dunder* can be had, throw away all the old stuff, as the cisterns containing it come into requisition.

When the still boils, the loud rumbling of the retorts gives intimation of the fact, and warns the stillermen to prepare for the spirit in the can pit: the fire, if burning strongly, is slightly checked, clean cans are placed in readiness, (one being under the pipe,) and the superintendent stands by with his proof bubbles, ready to test the strength of the spirit. It now begins to run, and a strong empyreumatic flavour is perceptible at first, therefore the first half a can, ($2\frac{1}{2}$ gallons), or can, is thrown into the low wine butt, then comes the strong rum, varying from 40 to 55 over proof.

First the 16 bubble, then so many cans of the 17, 18, 19, 20, 21, and 22, in succession, according to the strength of the spirit to be shipped. If 30 per cent over proof is required, directly the 20 bubble rises in the proof phial, cease throwing the spirit into the rum butt, and instead, let the succeeding cans be thrown into the low-wine butt; but if *proof* rum be wanted, then the spirit may continue to be taken to the rum butt, until the 28 bubble rises, which will bring it to 23 (generally,) allowing one bubble for coloring, and one for evaporation, in all bringing it to the 25 bubble or proof.

The London and Glasgow bubbles vary from each other much, the former being much stronger; a short time since

I tried a box of Liverpool bubbles by Sikes' hydrometer, and found that,

The 17	Bubble or bead was rather over	42	over-proof.
" 18	Ditto, ...	37	ditto ditto.
" 19	Ditto, ...	32	ditto ditto.
" 20	Ditto, ...	26½	ditto ditto.
" 21	Ditto, ...	21½	ditto ditto.
" 22	Ditto, ...	15½	ditto ditto.
" 23	Ditto, ...	10¼	ditto ditto.
" 24	Ditto, ...	5	ditto ditto.
" 25	Ditto, ...	0	proof.

But many of these proof bubbles are very bad guides, and full many a time and oft have I had trouble in getting them near the truth, grinding some, and adding to others according to a good old set. By taking this trouble they are brought to answer very well, and are generally used in the West Indies, whereas Sykes' hydrometer is very uncommon; I imagine in consequence of its being so very expensive. Our rum in Jamaica when intended for shipment to England, was generally sent to wharf at a strength that would cause the 19 bubble to sink down freely even when colored: or about 30 per over proof. Other times again it was put up at what we called "market proof," in which the 23 bubble would sink.

It is a generally received opinion in the West Indies, that rum put up for the home market at 30 per cent. over-proof, was of a superior flavour to that set up at a higher strength. This opinion was so strong, that in putting up rum for the house use, on estate, a few cans only would be taken from each running, (mostly on the 19 and 20 bubble,) until the puncheon was filled. This rum so taken, was termed the middle runnings, as being neither very strong, or very weak: and was considered that which would turn out

the finest flavour, when it had acquired age. I think that no good is gained by sending the spirit from India to England so strong as they usually do. Thirty per cent. over-proof when colored, is, in my opinion, the best, *paying* strength to ship at.

When the rum is running from the still, it is a good plan to let it run into a deep narrow basket, or cylindrical box filled with layers of charcoal, coarse at top and finer below; which serves to free the spirit from a great deal of that empyreumatic taste, so apparent in new rum. Some take great pains in improving the quality of their rum, and to my own knowledge the trouble is nothing, positively nothing, when the wonderful improvement of the spirit is considered.

One of the most safe and efficient of these plans I will notice, as I know that it was so successfully practised as to cause rum only a few months old to sell as two and three years' old, even in the Island (Jamaica.)

The rum as it came from the still was received into a deep basket, containing layers of charcoal, through which it drained into the cans beneath, and was carried off to the rum butt, fixed at a good elevation. Here it was (when the butt was filled) treated with a little caustic alkali, and some grained charcoal, well stirred up, and permitted to rest for a few days. It was then drawn down by the cock, (in a very small drippling stream,) through a pipe 20 feet long, stuffed with alternate layers of grained charcoal and sand, into a white oak butt, the inside of which had been well charred. If the butt were large it would take perhaps a couple of days to run off, or probably more, however two days and two nights generally sufficed for a moderate sized butt.

When it had all run off into the lower tier of butts, the spirit was again treated, according to taste, and improvement, with a small quantity of sweet spirits of nitre, tea leaves, and other little matters that are not particularly

essential. It was then colored, and remained ready either for shipment or sale.*

If intended for estate's use, it would be diluted with water, (which had been boiled, and had had a few avocada pear leaves in it,) to the general standard proof, or 25 bubble; otherwise to the 28, or even 30 bubble. And when all had been done, it was sent from the still-house to the manager's dwelling-house store, for use. If the improvement of rum be of value in the planter's estimation, as it should be, he ought to attend to this, and have the rum store so constructed, or rather the rum butts so arranged, that one tier of butts should be above the other, sufficiently high as to allow of the entire transmission of the contents of the former into the latter, and again from the lower into puncheons or hogsheads for shipment or sale. The highest butts (being 6 feet high,) would require therefore to be on a platform of 11 feet high, and the lower, on a horse of 4 feet. Three or four butts on the upper tier will be quite sufficient, and on the lower, double the number; whilst it must be remarked, that each butt requires to have a large hole at the bottom, to drain it off and cleanse it out thoroughly, occasionally; also that the cock must be placed some 6 inches from the bottom, otherwise a great portion of the dirt and other matter which has precipitated, will be again put in motion, and drawn down with the clear spirit.

Colouring rum is another very particular part of a distillerman's business, and accordingly should be strictly attended to, for I have often known really good rum spoilt by bad color.

The best sugar for making color, is that well grained brown sugar, (not too dark, nor too fair,) commonly used in Jamaica for this purpose. It is put into a copper or iron

* A loss of strength was always sustained by this method, varying from *one* to *two* bubbles, but the improved flavour was so material, that it sold as *old rum* in the market.

boiling pan, and heat is applied; one man stands by with a wooden staff and stirs it about continually, from the moment it begins to warm until it is finished; another makes the fire, which should be of cane trash, and instantly checked at will. The boiling goes on changing the color of the stuff from brown to a deep black; bubbles rise, large and heavy at first, then small and quickly; the wooden stirrer shews the color increasing to its proper shade, and the taste of the operator distinguishes the peculiar flavour desired. This nicety of taste, is the chief part of the operation, as on it depends the manner in which the rum to be colored, will be affected. No sweetness should be apparent, nor should any bitterness, but just the exact medium; arrived at this stage, some strong proof rum is very cautiously added to it by degrees, to keep it in a liquid state, otherwise it will become perfectly hard when cool. This strong rum, then, is added by degrees and well mixed, (the man stirring with might and main, the very smallest heat being allowed under the boiler, but *no flame*, or the rum may take fire,) until sufficient is thought to be given, when the boiler is removed at once from the fire, and its contents emptied into the "*color cask*" in the rum store. The color cask is generally a small hogshead, placed end up, on a wooden horse 2 feet high, and it has a plug-hole about 6 inches from the bottom, in order that its contents may be drawn off clear, and without disturbing any matter that might have precipitated. Well-made color, from good sugar, will require only about three pints to color a whole puncheon of one hundred gallons, and by being boiled with very strong rum, as mentioned, it lessens the strength very little. If a dark colored rum is desired, then more color may be added, until it arrives at the shade required,—but weak, bad color will take sometimes a large quantity to impart the proper color; and besides this, a very large portion often settles at the bottom, leaving the rum only slightly tinged, although ever so well mixed. Good color should be as thick as it can be

without forming a mass, and as clear and bright as possible; mixed with rum, it should at once give it a clear rich tint, devoid of any haziness or muddiness, but to insure this it had better be mixed in a pail with about 5 gallons of rum at a time, then carefully strained, and thrown into the rum butt or puncheon. If the color be good, there is no necessity for coloring rum until it is drawn down into puncheons for removal, when the color can be added, as described. Every batch of rum sent down to wharf, or sold, or otherwise removed from estate, should leave a sample on estate, for reference; which sample can be put into a small phial, corked, *sealed*, and labelled, describing strength, age, &c. &c.

Many people in India make their color from molasses and coarse *khar*, but I cannot approve of the practice, nor can I recommend it; quite the contrary.

Indeed I consider boiling color from molasses a folly that no planter would be led into, who has any pretension to still-house experience; it is a "penny wise and pound foolish" idea, that can only be excused in a young hand, egregiously ignorant in the manufacture and treatment of rum. It is better to throw away half a dozen batches of bad colour, than to allow one puncheon of good rum to be spoiled thereby: and I hope my brother planters will bear that in mind. They must reflect on the trouble and infinite care that is bestowed by the West India planters on *their* rum, and consider that unless such attention were bestowed, they never could expect to realize the prices they do. How much more then is it called for here; where not only good quality, but a *name*, has to be attained? Let East India planters but pay proper attention to the details I have set forth, and strive to improve the quality of their rum for the home market, instead of being satisfied with the horrid stuff now made, which is suitable only for the Calcutta bazars; let them I say, attend to their business and *not be above it*, and I will vouch for their making not only good *rum*, but good sugar.

The business of a sugar planter embraces many scientific pursuits, and may justly be termed *an honorable profession !!* one, of which no man, however well bred, has any reason to be ashamed. A thorough planter is a man of study, who calls to his aid the science of Chemistry, Horticulture and Agriculture; commands the mechanical and other *arts*, and differs from the followers of other learned professions, more in the freedom of his life, and the healthful employment of his time, than in the attainments resulting from education and study.

"Knowledge is power" as well in *plantership*, as in any other course of life that can be named, and I trust my brother planters will excuse my impressing on them the fact, that the more they strive to acquire the *former*, the better planters will they become, and the more successfully will they be able to yield the *latter*, in bringing to perfection the products of the soil they cultivate.

My task is now finished, my book is now complete, and as I have entitled it "*the Sugar Planters' Companion*," so may it be found, I trust, a companion, interesting and useful. *I have laboured to make it such*, and sincerely hope I may not be disappointed. If I have failed to make myself understood on any particular subject, I shall always be happy to explain matters more fully by letter, to any person desirous of such information, and finally I feel assured, that my endeavours to supply what has hitherto been so much wanted in India, will cause any faults contained in the work to be overlooked, in its general utility, and the good spirit in which it is written.

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PART II.—JANUARY TO DECEMBER, 1844.

CORRESPONDENCE AND SELECTIONS.

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TO PART II, VOL. III.

Correspondence and Selections.

THE GRAIN TRADE OF ARRACAN.

Extract of a letter from Captain A. Bogle, *Commissioner of Arracan, dated Kyouk Phyoo, 5th May,* 1844.

By the *Amherst,* I did myself the pleasure of sending you a box containing samples of rice as follows :—

Clean Makrensie, @ 25 rupees per 100 baskets of	12 seers each.
Unclean ditto, ...	@ 15 ditto.
Clean Latoore, ...	@ 25 ditto.
Unclean ditto, ...	@ 15 ditto.
White Benny, ...	@ 24 ditto.
Clean Moddoo, ...	@ 27 ditto.
Unclean ditto, ...	@ 20 ditto.

which I hope may reach you in safety.

Of the two first kinds, any quantity may be procured in the cold weather, and shipped from Akyab.

The prices of course vary with the abundance of the crops. Last year grain was the price stated, which is rather cheaper than usual; and as Akyab is a free port, and the harbour dues are merely nominal, the cost of a cargo must always be cheaper than at almost any place in the Bay of Bengal. Two rupees per bag of two maunds including all charges of bags, shipping, &c. would generally, I should say, be the maximum, and two rupees per bag more, will convey it to Mauritius.

I would therefore hope, that parties may be induced to turn their attention to the grain of Arracan, which has long been the common food of the inhabitants of the Madras Coast, many thousands of whom are now at Mauritius. There cannot therefore be a doubt, but that it would suit the market to a considerable extent.

Arracan Rice.

Arracan being a rice-producing country, it has long been my conviction, that great benefit would accrue from the introduction of Carolina paddy. I once got down a little which answered to admiration, and I have frequently applied for more, but I have never been able to get a proper supply. If you would kindly send me a large quantity, say 50 or even 100 maunds of genuine fresh Carolina paddy by the *Amherst* before the 1st July, I shall esteem it a great favor; but if it cannot be shipped so as to reach me by the above date, it will be too late for this season, and I must be content to wait another year. The matter is very important, and will, I am sure, have your best attention.

Report on Arracan Rice. By WILLIAM HAWORTH, ESQ.

I have examined the various samples of rice you sent me some days ago accompanied by a letter from Captain Bogle.

The rice I understand to be grown in Arracan; on the whole I find them so different in character from the general run of rice to be met with in Calcutta, that it is difficult to judge of their value compared with Bengal rice.

"*Clean Makrensie*" is a large bold grain, but exceedingly opaque and chalky, which is considered a great objection in the English market. I imagine it would be quite a new article at the Mauritius, and would require a considerable time to bring it into general use there; its low price however, would be a great temptation to planters, who have many labourers to provide with rice. If the seer alluded to, in Captain Bogle's list, is the bazar weight, I make this rice worth 13⅓ annas per maund at "Akyab."

"*Clean Latooree*" is a nice grain, but of bad colour; if it could be produced white, or with a less tinge of yellow, it would be a suitable grain either for this, or the English market, and would be cheap at the price named, 13⅓ annas per maund.

"*Clean Moddoo Mullah*" resembles the rice well known amongst the natives of Calcutta, called "*Bansmuttee*," and which is much liked by such as can afford to eat it, it often sells as high as Rs. 2 to 2/8 per maund. I think it might be imported into Calcutta to leave a good profit, it is very much like "Italian" rice.

The unclean descriptions need no comment, being the same as the above, with merely the outer husk taken off.

Calcutta, 7th June, 1844.

BHAUGULPORE BRANCH SOCIETY'S MAY EXHIBITION.

Extract of a letter from Major T. E. A. Napleton, *Secretary of the Bhaugulpore Agri-Horticultural Society, dated the 10th of May,* 1844.

I do myself the pleasure to forward for the information of the Parent Society, an account of our last Agri-Horti. and Floricultural exhibition held on Monday evening last, and I venture to hope, that it may prove satisfactory.

An exhibition of Agri-Horti. and Floricultural produce took place on the 7th May 1844, at Cleveland House, and was attended by about 70 resident members, a number of visitors, and last though not least, the ladies of the station. Forty large pieces of table were crowded with specimens of grain, vegetables, fruit, and flowers.

The umpires in the Agricultural Department were Mr. G. F. Brown, Mr. G. W. Battye, Mr. P. Onrait, Baboo Gooroo Churn Mitter, and Mudden Takoor, and they carefully examined the several samples of wheat, barley, oats, grain, peas, safflower, mangul wurzul, potatoes, tobacco, &c. and the following prizes were awarded :—

A silver medal to C. H. Barnes, Esq. planter and zumeendar of Colgong, for the finest samples of wheat and barley. Another silver medal was awarded to Major Napleton, for the best potatoes, grain, tobacco, &c.; the honor of receiving which he declined in favor of the Native zumeendars, and it was accordingly awarded to Rajah Oodit Narrain Sing, a zumeendar of this district, for the best sample of oats and 2d best wheat. A money prize of six rupees was awarded to Muddun Takoor, a large zumeendar residing near Bhaugulpore, for some excellent samples of wheat and barley. A prize of three rupees was awarded to Muhasha Omanath Ghose, for the best mangul wurzul, and the same sum to Ubdoollah Khan for the best safflower.

The cultivation of the potatoe at this place has attained almost perfection during the last year. Four potatoes from Cherra Poonjee

seed weighed 77 rupees. Five potatoes from Darjeeling seed weighed 80 rupees, or a Calcutta seer. All these were grown on the Cleveland House estate.

This exhibition may on the whole be considered an eventful one to this our Branch Society. The introduction of mangul wurzul into the district will, no doubt, when the zumeendars and ryots become fully acquainted with its useful properties as an article of food for their cattle, prove a boon to them, for it is remarkably hardy in its growth, and when almost every other vegetable is dried up by the hot weather, the mangul wurzul grows most luxuriantly.

The barley grown in our Public Garden from Darjeeling seed ranked only 2d best, Mr. C. H. Barnes of Colgong, having sent a finer sample grown on his zumeendaree. Some fine specimens of white gram were on the table, and some excellent musters of safflower and peas. The umpires took great pains with their duty, and expressed much satisfaction at the fine display of grain brought to the show rooms.

In the vegetable department, Mr. C. Stuart, Captain Don, and Mr. J. Pontet were the umpires. The show of vegetables was good, beyond all expectation for this season of the year. The produce of the Public Garden was much praised, but not allowed to be put in the scale of competition for prizes. A present of sixteen rupees was however bestowed on the Mallees. Some fine samples of asparagus, purple and white, nohl kohl, green savoy and sugar loaf cabbage, carrots, sweet turnips, Bombay onions and leeks, all from English seed, together with a fine display of indigenous vegetables, were to be seen, and several prizes were awarded, and the umpires took great pains with their duty and discharged it most impartially.

In the Floricultural Department, there was a beautiful collection of bouquets, chiefly from the gardens of Mr. G. F. Brown, Captain Don, and Cleveland House. The specimens mainly consisted of seven sorts of geranium, five of roses, four of pinks, sweet william, honey suckle, zinnias of all colours, verbena, sweet briar, russelias, euphorbias, wax flowers in great abundance and beauty, lillies of several sorts, the diptrex or tonquin bean flowers, ixoras, bignonias, &c. The passiflora family of five sorts could not be persuaded to make their appearance, as they are in hot weather invisible after 10 o'clock

in the forenoon, and the same remark applies to the convolvulus family. The umpires in the Floricultural Department were, Mrs. Ellerton, Mrs. Battye, and Mrs. Sutherland, and their good judgment and prompt decision were very apparent. The same umpires then proceeded to the Fruit Department, in which some very fine specimens of leechees and plantains in particular were to be seen, also mangoes, peaches, alloo bokharas, shaddocks, lemons, papias, &c. and several prizes were awarded. The company did not leave the show rooms till nearly dark, and thus ended the first show of the second year of this institution.

Comparative produce of different varieties of Wheat in England. Communicated by Melmoth Hall, Esq.

To J. Hume, Esq. *Secretary of the Agri-Horticultural Society, Calcutta.*

Dear Sir,—The growth and produce of wheat in this country having begun to excite more than ordinary attention, the enclosed table of the comparative produce of different varieties in England may perhaps prove interesting to such of the members of your Society as have devoted any time to the investigation of the subject.

It details the result of an experiment conducted with great precision by a gentleman named Morton, residing near Stroud, a fuller account of which may be found in the Journal of the English Agricultural Society, vol. 1, p. 41.

The corns consisting of 792 of each variety, having been selected from the finest of their kind that could be procured, were respectively sown in the 3d week of November, at equal measured distances in beds, each containing 99 superficial feet; every separate variety being carefully kept distinct from the others.

This table possesses little or no value as affording a criterion whereby to estimate the comparative advantage of sowing any particular variety, for a single trial of this kind, however carefully conducted, will not afford even a remote approximation to the truth, which can be only arrived at by repeated experiments on an extended scale.

It may, however, possess interest as a matter of curiosity, and as such, I take the liberty to send it.

Lehra; Gorruckpore, 13*th April*, 1844. I remain, &c.
(Signed) MELMOTH HALL.

	Number of Plants which vegetated.	Weight of Grain produced in lbs.	Length of Straw.		Weight of Straw produced in lbs.	Rate of produce of Grain per Acre in Bushels of 64 lbs.	Rate of produce of Straw per Acre.			
			Ft.	In.			Tons.	Cwt.	Qrs.	lbs.
Old Red Lammas, ...	405	6	5	8	16½	41¾	3	5	2	21
Golden Drop, ...	501	6¾	5	6	15¼	46¾	3	0	0	3
Ten-rowed Prolific, ...	401	4½	5	5	12¾	27	2	10	0	10
Hunter's, ...	519	4½	5	6	12¾	27	2	12	0	10
Thick-set Suffolk, ...	672	10½	5	8	19½	72¼	3	5	2	14
Hickley's Prolific, ...	657	10⅙	5	7	16½	69½	3	5	2	24
White Taunton, ...	487	6	5	6	15¼	41½	3	0	0	0
Silver Drop, ...	574	8	5	6	18½	55	3	12	2	12
Scotch White, ...	413	6¼	5	9	16½	43	3	5	2	24
Talavera, ...	358	5¼	5	8	14½	36	2	16	3	14
Smither's Hereford White,	473	9½	5	6	17½	65½	3	8	3	20
Red Wheat, ...	540	12	5	0	22	82½	4	7	0	2
Egyptian Cone, ...	264	3⅜	6	0	8¼	23	1	11	2	2
Red Straw Lammas, ...	282	4½	5	8	14½	27	2	16	3	4
Blue Cone, ...	528	6	6	0	9¾	41½	1	16	1	16
Red Cone, ...	336	10	5	3	12½	68¾	2	9	0	0

A Memorandum by Mr. J. W. MASTERS, *on the most useful Timber Trees of Upper Assam.*

To MAJOR F. JENKINS, *Agent to Governor General, North Eastern Frontier, &c. &c. &c.*

MY DEAR SIR.—In compliance with the request contained in your note of the 13th March, I now have the pleasure to forward an imperfect list of timber trees to be found in this part of the Province. I observe that in the list of Goalpara Woods by Dr. Buchanan, you

have marked with pencil 90 kinds; these are also in Dr. M'Cosh's Topography of Assam, and the greater part of them are to be found either in the plains or on the first range of low hills; but they are not all valuable timber trees; the wood of several of those enumerated in the list is very soft and perishable. The " List of Indian Woods," collected by Dr. Wallich, and examined by Mr. Aikin, contains 456? species; but it was not intended by either of those gentlemen to be understood, that every individual species produced valuable timber, some of them being creepers, and others producing wood of the softest kind; I have therefore thought it preferable to arrange the different species in the following list according to the strength and durability of the wood, as estimated by the natives of the country, and to introduce none but such as are known to produce good, serviceable timber.

List of Timber Trees in Upper Assam.

1	Mesua ferrea, Linn.	নাহর	Nahor
2	Lagerstoemia Reginæ, Roxb.	আজার	Ajar
3	Artocarpus chaplasha, Roxb.	*চাম	Sam
4	A——— integrifolia, Linn.	কঁঠাল	Konthal
5	Shorea robusta, Roxb.	*সাল	Hal
6	Liquidamber species	জুটুলি	Jutuli
7	Michelia species	তিতাচপা	Tita sopa
8	Cedrela toona, Roxb.	পমা	Poma
9	Gmelina arborea, Roxb.	গমারি	Gomari
10	Inga bigemina, Willd.	মজ	Moj
11	Syzygium jambolanum, Dec.	জামু	Jamu
12	Pierardia sapida, Roxb.	লেটেকু	Leteku

The above are considered by the natives of this neighbourhood to produce timber of the first quality, both for strength and durability, and are recommended in preference to all others for posts, which

* The Assamese চ is synonymous with S, as well as Ch, and স with H, as well as S.

have to stand partly in the ground and partly out. They stand well, but posts 2 feet in diameter of some kinds will be completely decayed in two years. The *Hal,* S. robusta, I have only met with in Bura Gohain Habi, and along the Suntook the; *Jutuli* in Rokan Habi and Motok; the rest are common in this Zillah and near the hills.

13	Dipterocarpus species	মেক্কাহি	Mekahi
14	D———	হোলোঙ্গ	Hólóng
15	Walsura robusta, Roxb.		
16	Dalbergia species	হেটুরুকা	Heturuka
17	Aquilaria agallocha, Roxb.	সাঁচি	Hansi
18	Michelia champaca, Linn.	ফুলচপা	Phul sopa
19	M——— oblonga, Wall.?		
20	Chickrassia tabularis, Juss.	পমা	Poma
21	Mimosa elata, Roxb.		
22	Castanea species	সিঙ্গরি	Hingori
23	C——— species	কাঁটাসিঙ্গরি	Kanta Hingori
24	Laurus sasafras? glandulifera?	গন্ধসরৈ	Gondhsoroi

All these produce excellent timber; the first four grow to an immense height. The *Holong, Hansi* and Walsura are common in Motok, and Rokan Habi; the *Mekahi* I have met with on the hills only, it is plentiful at Hukan Juri and between Namsang and Langta. The *Heturuka* is found at Rongagora and on the Naga hills 120 feet high. The others are common near the hills.

25	Andrachne trifoliata, Roxb.	উরিয়াম	Uriam
26	Salix tetrasperma, Roxb.	ভেহ	Bheh
27	Nauclea cadamba, Roxb.	রঘু	Roghu
28	Stilago Bunias, Linn.	হেলচ	Helos
29	Bignonia chelonoides,	পারলি	Paroli
30	Gordonia integrifolia, Roxb.	নগা ভেহ	Naga Bheh
31	Careya arborea, Roxb.	কোমবিয়া	Kumbia
32	Terminalia citrina, Roxb.	সিলিখা	Hilikha

33	T————Chebula, Retz.	সিলিখা	Hilikha
34	T————Berryi, W. & A.		
35	T————Arjuna	অর্জুন	Orjun
36	T————paniculata, W. & A.		
37	T————species	বোলা	Bola
38	Buchananiæ species		
39	Bauhinia purpurea, Linn.		
40	B————triandra, Roxb.		
41	Betulæ species	পদ্ম	Podmo
42	Dalbergia frondosa, Roxb.		
43	D————zeylanica, Linn.		
44	D————robusta, Roxb.		
45	Chaulmoogra odorata, Roxb.	লেমটেম	Lemtem
46	Cluytia collina, Roxb.		
47	C————oblongifolia		
48	Diospyros stricta, Roxb.		
49	D————glutinosa, Roxb.	কেন্দু	Kendu
50	Ehretia serrata, Roxb.	বোয়াল	Bual
51	Elaeocarpus Ganitrus, Roxb.	রুদ্রাখ	Rudrakh
52	E————rugosus, Roxb.		
53	E————aristatus, Roxb.		
54	Emblica officinalis, Gaert.	আমলখি	Amlokhi
55	Garcinia pedunculata, Roxb.	থৈকেরা	Thekera
56	Xanthochymus dulcis, Roxb.		
57	X————pictorius, Roxb.	টেপর	Tepor
58	Holigarna racemosa, Roxb.		
59	Juglans pterococca, Roxb.		
60	Kleinhovia hospita, Linn.		
61	Mangifera indica, Linn.	আম	Am
62	M————sylvatica, Roxb.	বন আম	Bon Am
63	Millingtonia species		
64	Nageia Putrunjiva, Roxb.		
65	Tamarindus indica, Linn.	তেতেলি	Teteli
66	Ulmus virgatus, Roxb.		
67	Mimusops Elengi, Linn.	বকুল	Bokul
68	Kydia calycina, Roxb.		
69	Phillyrea robusta, Roxb.		

70 Phillyrea species,

71 Callicarpa arborea, Roxb. খোজা Khoja

72 C——— Reevesii,

The whole of the above produce very useful timber fit for the interior of buildings and various kinds of furniture. The Podma, Kleinhovia, Holigarna, and Phillyrea, I have seen on the Naga hills only, all the rest are met with in the plains.

Sibsagor, 19th April, 1844. J. W. Masters.

P.S.—Since writing the above, I have been furnished by Lieut. E. T. Dalton, with specimens of a species of Podocarpus, from the district of Lakhimpur, found on the banks of the Derju Nodi and the hills in that direction; a very ornamental tree, wood smooth, of fine grain, and easily worked; reported by the natives to be very durable. J. W. M.

A Catalogue of Plants growing in the Honorable East India Company's Botanic Garden, Calcutta, alphabetically arranged, with Authorities and Natural Families annexed. By J. W. Masters, 1837.

I believe that the following Catalogue contains the names of the principal part of the Plants now growing in this Garden, with the exception of about one or two hundred undetermined species. Many species belonging to the Natural Families Gramineæ, Cyperaceæ, Euphorbiaceæ and Filices, with a few others have been introduced on the authority of the late Dr. Roxburgh, as I have either not seen them in the garden, or am unacquainted with them.

Botanic Garden, September 16, 1837. J. W. Masters.

Abelmoschus, Med. Malvaceæ.
- moschatus, Moench.
- Wightianus, Wall.

Abroma, Linn. Byttneriaceæ,
- augusta, Linn.

Abrus, Linn. Leguminosæ.
- precatorius, Linn.
- pulchellus, Wall.

Abutilon, Dill. Malvaceæ.
- crispum, G. Don.
- graveolens, W. and A.
- indicum, G. Don.
- periplocifolium, G. Don.
- polyandrum, W. and A.
- tomentosum, W. and A.

Acacia, Neck. Leguminosæ.
- affinis, Swt.
- amara, Willd.
- arabica, Willd.
- arborea, Willd.
- astringens.
- cæsia, W. and A.
- Catechu, Willd.
- concinna, Dec.
- diluta, Wall.
- dumosa, W. and A.
- ferruginea, Dec.
- Intsia, Willd.
- Kerriana, Wall.
- latronum, Willd.
- leucophlœa, Willd.
- lophantha, Willd.
- mollis, R. Br.
- odoratissima, Willd.
- pennata, Willd.
- speciosa, Willd.
- stipulata, Dec.
- Sundra, Dec.
- tomentosa, Willd.
- vera. Bauh.
- Wightii, Grah.

Acalypha, Linn. Euphorbiaceæ.
chinensis, Roxb.
ciliata, Forsk.
conferta, Roxb.
cylindrica, Roxb.
indica, Linn.
Acanthophippium, Blum. Orchideæ.
sylhetense, Lindl.
Acanthus, Linn. Acanthaceæ.
ilicifolius, Linn.
maderaspatensis, Willd.
leucostachyus, Wall.
Acer, Linn. Acerineæ.
laevigatum, Wall. ?
Negundo, Linn.
oblongum, Wall.
Achillea, Linn. Compositæ.
crithmifolia, Kit.
nobilis, Linn.
Achras, Linn. Sapoteæ.
Sapota, Linn.
Achyranthes, Linn. Amarantaceæ.
alternifolia, Roxb.
aquatica, Roxb.
argentea, Roxb.
aspera, Roxb.
ferruginea, Roxb.
incana, Roxb.
lanata, Roxb.
lappacea, Roxb.
Monsoniæ, Roxb.
prostrata, Roxb.
scandens, Roxb.
triandra, Roxb.
virgata, Desf.
Acorus, Linn. Acoraceæ.
Calamus, Linn.
gramineus, Ait.
Acrostichum, Linn. Filices.
emarginatum, Roxb.
flagelliferum, Wall.
Adamia, Wall. Saxifrageæ.
cyanea, Wall.
Adansonia, Linn. Bombaceæ.
digitata, Linn.
Adelia, Linn. Euphorbiaceæ.
neriifolia, Roth.
Adenanthera, Linn. Leguminosæ.
falcata, Linn.
pavonina, Linn.
Adiantum, Linn. Filices.
caudatum, Linn.
Adhatoda, N. ab E. Acanthaceæ.
Betonica. Nees.
corynostachya, Wall.
vasica, Nees.
Aegle, Corr. Aurantiaceæ.
Marmelos, Corr.
Aerides, Lour. Orchideæ.
affine, Wall.
odontochilum, Wall.
odoratum, Lour.
refractum, Wall.
rostratum.
Aeschynanthus, Jack. Cyrtandraceæ.
Roxburghii, Wall.
Aeschynomene, Linn. Leguminosæ.
aspera, Linn.
paludosa, Roxb.
Aesculus, Linn. Hippocastaneæ.
indica.
punduana.
Agapanthus, Herit. Hemerocallideae
praecox, Willd.
umbellatus, Herit.
Agati, Adans. Leguminosae.
grandiflora, Desv.
Agave, Linn. Amaryllideae.
Cantala, Wall.
lurida, Ait.
tuberosa, Mill.
Ageratum, Linn. Compositae.
aquaticum, Roxb.
conyzoides, Linn.
cordifolium, Roxb.
Aglaia, Lour. Meliaceae.
argyrophylla, Wall.
decandra, Wall.
odorata, Lour.
spectabilis.
undulata, Wall.
Agrimonia, Linn. Rosaceae.
nepalensis, Don.
Agrostis, Linn. Gramineae.
linearis, Roxb.
tenacissima, Roxb.
Ailanthus, Desf. Zanthoxylaceae.
excelsa, Roxb.
Aira, Linn. Gramineae.
filiformis, Koen.
pallescens, Kit.

Ajuga, Linn. Labiatae.
bracteata,
disticha, Roxb.
fruticosa, Roxb.
Alangium, Juss. Alangieæ.
hexapetalum, Lam.
Aleurites, Forst. Euphorbiaceae.
pentaphylla,
triloba, Forst.
Alhagi, Tourn. Leguminosae.
Maurorum, Tourn.
Allamanda, Linn. Apocyneae.
cathartica, Linn.
Allium, Linn. Asphodeleae.
esculentum, Linn.
Cepa, Linn.
Porrum, Linn.
sativum, Linn.
tuberosum, Roth.
Alnus, Tourn. Amentace.
dioica, Roxb.
Aloe, Linn. Hemerocallideæ.
arachnoides, Thun.
attenuata, Haw.
coarctata. Sch.
ciliata.
ferox, Dec.
Lingua, Willd.
maculata, Willd.
perfoliata, Linn.
prolifera, Haw.
Saponaria, Haw.
variegata, Linn.
verrucosa, Linn.
Alpinia, Linn. Scitamineae.
Allughas, Rosc.
bracteata, Roxb.
calcarata, Rose.
Galanga, Swzt.
magnifica.
nutans, Roxb.
porrecta.
Alsodeia, Thouars. Violarieae.
bengalensis, Wall.
Roxburghii, Wall.
Alstonia, R. Br. Apocyneæ.
macrophylla, Wall.
neriifolia, Wall.
scholaris, R. Br.
spectabilis, R. Br.
Alstroemeria, Linn. Amaryllideae.
pulchella, Linn.
Althaea, Linn. Malvaceae.
officinalis, Linn.
rosea, R. and P.
Araucaria, Juss. Coniferae.
Cunninghamii, G. Don.
excelsa, Ait.
Alysicarpus, Neck. Leguminosae.
vaginalis, Dec.
Alyxia, Banks. Apocyneæ.
Hunteri,
stellata,
Amaranthus, Linn. Amaranthaceæ.
atropurpureus, Roxb.
caudatus, Linn.
gangeticus, Roxb.
lanceolatus, Roxb.
lividus, Roxb.
polygamus, Roxb.
polygonoides, Roxb.
spinosa, Roxb.
tenuifolius, Roxb.
tristis, Roxb.
viridis, Roxb.
Amaryllis, Linn. Amaryllideæ.
equestris, Jacq.
formosissima, Linn.
fulgida, Kerr.
radiata, Roxb.
Reginæ, Linn.
revoluta.
Ambrosinia Linn. Aroideae.
ciliata, Roxb.
spiralis, Roxb.
Amherstia, Wall. Leguminosae.
nobilis, Wall.
Ammannia, Linn. Salicariae.
octandra, Roxb.
vesicatoria, Roxb.
Amomum, Linn. Scitamineae.
aromaticum, Roxb.
dea batum, Roxb.
maximum, Roxb.
Amoora, Roxb. Meliaceae.
Rohituka, W. and A.
Amorpha, Linn. Leguminosae.
fruticosa, Linn.
* Anacardium, Linn. Terebinthaceae
occidentale, Linn.

Anagallis, Linn. Primulaceæ.
arvensis, Linn.
Anatherum, Beauv. Gramineæ.
muricatum, Beauv.
Ancistrocladus, Wall. Malpighiaceæ.
extensus, Wall.
Andrachne, Linn. Euphorbiaceæ.
trifoliata, Roxb.
Andropogon, Linn. Gramineae.
acicularis, Linn.
bicolor, Roxb.
binatus, Roxb.
Bladhii, Roxb.
conjugatus, Roxb.
filiformis, Roxb.
halepensis, Sib.
lanceolatus, R. Br.
laxus, Roxb.
Martini, Roxb.
miliaceus, Roxb.
Nardus, Linn.
pertusus, Willd.
punctatus, Roxb.
saccharatus, Roxb.
scandens, Roxb.
serratus, Roxb.
tenellus, Roxb.
tristachys, Roxb.
Anethum, Linn. Umbelliferæ.
graveolens, Linn.
Sowa, Roxb.
Anguillaria, R. Br. Melanthaceæ.
indica, R. Br.
Anona, Linn. Anonaceae.
Cherimolia, Linn.
laevigata.
muricata, Linn.
reticulata, Linn.
squamosa, Linn.
Anthericum, Linn. Asphodeleae.
tuberosum, Roxb.
Anthistiria, Linn. Gramineae.
arundinacea, Roxb.
ciliata, Roxb.
cymbaria, Roxb.
heteroclita, Roxb.
polystachya, Roxb.
prostrata, Roxb.
scandens, Roxb.
Antiaris, Lesch. Urticeae.
toxicaria, Lesch.
Amphiraphis, Kunth. Compositæ.
intermedia, Link.
Antidesma, Linn. Antidesmeae.
acuminata,
paniculata, Roxb.
macrophylla, Wall.
pubescens, Roxb.
rugosa,
Antirrhinum, Linn. Scrophularineae.
majus, Linn.
Apaturia, Lindl. Orchideæ.
Smithiana, Lindl.
Apium, Linn. Umbelliferae.
graveolens, Linn.
involucratum.
Petroselinum, Linn.
Apluda, Linn. Gramineae.
aristata, Linn.
geniculata, Roxb.
Aponogeton, Thun. Fluviales.
monastachyon, Linn.
Aporum, Blum. Orchideæ.
anceps, Lindl.
cuspidatum, Wall.
Aquilaria, Linn. Aquilarineæ.
Agallocha, Roxb.
Arachis, Linn. Leguminosae.
hypogaea, Linn.
Aralia, Linn. Araliaceæ.
digitata, Willd.
nudiflora.
umbraculifera, Roxb.
Ardisia, Swz. Myrsineae.
citrifolia, Wall.
colorata, Roxb.
crenulata, Vent.
floribunda.
glandulosa, Roxb.
glaucescens, Wall.
hymenandra, Wall.
littoralis, R. Br.
mollis.
nana.
neriifolia, Wall.
nutans, Wall.
oxyantha, Wall.
paniculata, Roxb.
pedunculosa, Wall.
solanacea, Roxb.
odontophylla, Wall.

Areca, Linn. Palmae.
Catechu, Linn.
oleracea, Jacq.
triandra, Roxb.
Argyreia, Lour. Convolvulaceæ.
Bona nox, Swt.
cuneata, Ker.
cymosa, Swt.
festiva, Wall.
ornata,
speciosa,
splendens, Swt.
Wallichii, Choisy.
Aristea, Linn. Irideæ.
capitata, Ker.
Arrhenatherum, Beauv. Gramineæ.
bulbosum, Swt.
Artabotrys, R. Br. Anonaceae.
densiflora.
odoratissima, R. Br.
Artemisia, Linn. Compositae.
Absinthium, Linn.
chinensis, Linn.
cuneifolia?
elegans, Roxb.
grata, Wall.
hemisphærica, Roxb.
indica, Willd.
parviflora, Ham.
vulgaris, Linn.
Artocarpus, Forst. Urticeae.
angustifolius, Roxb.
Chaplasha, Roxb.
echinatus, Roxb.
incisus, Linn.
integrifolius, Linn.
Locucha, Roxb.
oblongus, Wall.
pubescens?
Arum, Linn. Aroideae.
attenuatum, Wall.
apertum,
orixense, Roxb.
punctatum,
sessiflorum, Roxb.
sinuosum, Wall.
trilobatum, Linn.
viviparum, Roxb.
Arundina, Blum. Orchideae.
bambusifolia.
Arundo, Linn. Gramineae.
bengalensis, Roxb.
Arundo bifaria, Roxb.
gigantea, Roxb.
Karka, Roxb.
Ascaricida, Cass. Compositae.
anthelmintica, Swt.
Asclepias, Linn. Asclepiadeae.
acida, Roxb.
acuminata, Pursh.
asthmatica, Linn.
curassavica, Linn.
fruticosa, Linn.
laurifolia, Mx.
odoratissima, Roxb.
parasitica, Roxb.
pulchella, Roxb.
racemosa, Roxb.
tunicata, Roxb.
Asparagus, Linn. Asphodeleae.
acerosus, Roxb.
adscendens, Roxb.
aethiopicus, Linn.
officinalis, Linn.
racemosus, Willd.
Asplenium, Linn. Filices.
bipinnatum, Roxb.
heterophyllum, Roxb.
Nidus, Linn.
Aster, Linn. Compositae.
adulterinus, Willd.
aestivus, Ait.
annuus, Linn.
chinensis, Linn.
dumosus, Linn.
elegans, Willd.
mutabilis, Linn.
Asteriscium, Chamiss. Umbelliferae.
oblongum, Wall.
Asterogyne, Wall.
coriacea, Wall.
* Asystasia N. ab. E. Acanthaceae.
Neesiana.
Aubertia, Borg. Zanthoxyleae.
iliciodora,
* Astrapaea, Lindl. Byttneriaceae.
tiliæfolia, Swt.
Wallichii, Lindl.
Averrhoa, Linn. Oxalideae.
Bilimbi, Linn.
Carambola, Linn.
Azadirachta, Juss. Meliaceae.
indica, Juss.

Bacobotrys, Forst. Myrsineae.
argentea, Wall.
indica, Roxb.
macrophylla, Wall.
nemoralis, Forst.
ramentacea, Roxb.
Balsamodendron, Kunth. Terebinthaceae.
commiphora, W. and A.
Roxburghiana, W. and A. ?
Bambusa, Schreb. Gramineae.
baccifera, Roxb.
arundinaceæ, Willd.
Balcua, Roxb.
gigantea, Wall.
nana, Roxb.
spinosa, Ham.
stricta, Roxb.
Tulda, Roxb.
Banisteria, Linn. Malpighiaceae.
auriculata, Cav.
laurifolia, Linn.
Barleria, Linn. Acanthaceae.
buxifolia, Roxb.
ciliata, Roxb.
coerulea, Roxb.
cristata, Roxb.
dichotoma, Roxb.
hirsuta, Nees.
Prionitis, Roxb.
Barringtonia, Forst. Myrtaceae.
acutangula, Gaert.
racemosa, Roxb.
speciosa, Linn.
Basella, Linn. Chenopodeae.
alba, Linn.
cordifolia, Lam.
lucida, Linn.
rubra, Linn.
Bassia, Koen. Sapoteae.
butyracea, Roxb.
latifolia, Roxb.
longifolia, Linn.
Batis, Linn. Urticeae.
aurantiaca,
spinosa, Roxb.
Bauhinia, Linn. Leguminosae.
acuminata, Linn.
anguina, Roxb.
bidentata, Jack.
brachycarpa,
corymbosa, Roxb.
Bauhinia diphylla,
malabarica, Roxb.
piperifolia, Roxb.
polycarpa,
porrecta, Ait.
purpurea, Linn.
racemosa, Lam.
retusa, Poir.
semibifida, Roxb.
speciosa, Hort.
tomentosa, Linn.
triandra, Roxb.
Vahlii, W. and A.
variegata, Linn.
Beaumontia, Wall. Apocyneae.
grandiflora, Wall.
Begonia, Linn. Begoniaceae.
argyrostigma, Fish.
humilis, Dry.
papillosa, Grah.
reniformis, Dry.
Wightii, Wall.
* Benincasa, Savi. Cucurbitaceae.
cerifera, Savi.
Bentinckia, Berry. Palmae.
Condapana, Roxb.
Berberis, Linn. Berberideae.
asiatica, Roxb.
aristata, Dec.
pinnata, Lag.
Bergera, Koen. Aurantiaceae.
integerrima, Roxb.
Koenigii, Roxb.
Berrya, Roxb. Tiliaceae.
Ammomilla, Roxb.
Beta, Linn. Chenopodeae.
bengalensis, Roxb.
vulgaris, Linn.
Bidens, Linn. Compositae.
decomposita, Wall.
rigida,
Wallichii, Dec.
* Beilschmiedia, N. ab. E. Laurineae.
Roxburghiana, Nees,
Bignonia, Linn. Bignoniaceae.
adenophylla, Wall.
amoena,
capreolata, Linn.
Catalpa, Linn.
cauliflora.

Bignonia crispa, Ham.
crucigera, Linn.
glutinosa, Wall.
grandiflora, Willd.
indica, Willd.
multijuga.
parviflora.
serrulata, Wall.
stipulata, Roxb.
suaveolens, Roxb.
suberosa, Roxb.
undulata, Sm.
xylocarpa, Roxb.
Biophytum, Dec. Oxalideae.
sensitivum, Dec.
Bixa, Linn. Bixineae.
Orellana, Linn.
purpurea,
Blackwellia, Comm. Homalineae.
propinqua, Wall.
spiralis, Wall.
Bletia, R, and P. Orchideae.
amethystina,
hyacinthina, R. and P.
verecunda, R. and P.
Smithiana.
Blighia, Koen. Sapindaceae.
sapida, Koen.
Blitum, Linn. Chenopodeae.
capitatum, Linn.
virgatum, Linn.
Boehmeria, Linn. Urticeae.
viminea.
Boerhaavia, Linn. Nyctagineae.
diffusa, Willd.
procumbens, Roxb.
repanda, Willd.
Bombax, Linn. Bombaceae.
Ceiba, Linn.
malabaricum, Dec.
Borassus, Linn. Palmæ.
flabelliformis, Linn.
Boswellia, Roxb. Terebinthaceae.
thurifera, Coleb.
serrata, Stack.
Brachystelma, R. Br. Asclepiadeae.
tuberosum, R. Br.
Bradleia, Gaert. Euphorbiaceae.
amoena, Wall.
hirsuta, Roxb.
lanceolaria, Roxb.
Bradleia multilocularis, Roxb.
nitida, Roxb.
Bragantia, Lour. Aristolocheae.
piperifolia. Wall.
Brassia, R. Br. Orchideae.
maculata, R. Br.
Brassica, Linn. Cruciferae.
asperifolia.
campestris, Linn.
chinensis, Linn.
Eruca, Linn.
erucoides, Roxb.
fruticosa, Cyr.
oleracea, Linn.
orientalis, Linn.
præcox, Kit.
Rapa, Linn.
sabularia, Brot.
Breweria, R. Br. Convolvulaceae.
Roxburghii, Choisy.
Bridelia, Willd. Euphorbiaceae.
attenuata, Wall.
Berriana, Wall.
lanceæfolia, Roxb.
scandens, Willd.
spinosa, Willd.
Bromelia, Linn. Bromeliacae.
bracteata, Swz.
humilis, Jacq.
Karatas, Linn.
sylvestris, Willd.
Brosimum, Swzt. Urticeae.
Alicastrum, Swzt.
Broussonetia, Vent. Urticeae.
papyrifera, Vent.
Browallia, Linn. Scrophularineae.
elata, Linn.
Brownlowia, Roxb. Tiliaceae.
elata, Roxb.
Brucea, Schreb. Xanthoxyleae.
mollis, Wall.
sumatrana, Roxb.
Brunsfelsia, Linn. Solaneae.
undulata, Swzt.
Brunswigia, Ker. Amaryllideae.
falcata, Ker.
Josephina, R. S.
multiflora, Hirst.
pumila.
Bryophyllum, Salis. Crassulaceae.
calycinum, Salisb.

Buchanania, Roxb. Terebinthaceæ.
angustifolia, Roxb.
latifolia, Roxb.
Buddlea, Linn. Scrophularineæ.
madagascariensis, Vahl.
Neemda, Roxb.
paniculata, Wall.
Bulbine, Willd. Asphodeleæ.
rostrata, Willd.
Bulbophyllum, Thouars. Orchideae.
auricomum, Lindl.
leopardinum.
Bunias, Linn. Cruciferæ.
aspera, Retz.
Erucago, Linn.
Burmannia, Linn. Burmanniæ.
disticha, Linn.
Butea, Roxb. Leguminosæ.
frondosa, Roxb.
parviflora, Roxb.
superba, Roxb.
Butomus, Linn. Butomeæ.
umbellatus, Linn.
Buxus, Linn. Euphorbiaceæ.
chinensis?
Byrsonima, Rich. Malpighiaceæ
lucida, Dec.
Byttneria, Loef. Byttneriaceæ.
aspera, Coleb.
catalpaefolia, Jacq.
ovata, Lam.
pilosa, Roxb.

Cacalia, Linn. Compositæ.
aurantiaca,
bicolor, Roxb.
cylindrica, Lam.
hieracioides, Willd.
Klinia, Linn,
purpurascens, Wall.
Cactus, Linn. Cacteæ.
hybridus.
indicus.
Jenkinsonii.
Melocactus, Linn.
setosus.
triangularis.
Caesalpinia, Linn. Leguminosæ
chinensis, Roxb.
digyna, Rott.
coriaria, Willd.
Caesalpinia mimosoides, Lam.
paniculata, Roxb.
Sapan, Linn.
sepiaria, Roxb.
sumatrana, Roxb.
tortuosa, Roxb.
Cajanus, Dec. Leguminosæ.
indicus, Spren.
Calamus, Linn. Palmae.
Draco, Willd.
extensus, Roxb.
fasciculatus, Roxb.
gracilis, Roxb.
hostilis,
humilis, Roxb.
latifolius, Roxb.
Rotang, Willd.
Calanthe, R. Br. Orchideae.
Masuca, Lindl.
veratrifolia, R. Br.
Calathea, Mey. Scitamineae.
zebrina, Lindl.
Caldasia, Willd. Polemoniaceae.
heterophylla, Willd.
Calendula, Linn. Compositae.
officinalis, Linn.
Calla, Linn. Aroideæ.
aethiopica, Linn.
aromatica, Roxb.
calyptrata, Roxb.
oblongifolia, Roxb.
picta, Roxb.
rubens, Roxb.
virosa, Roxb.
Callicarpa, Linn. Verbenaceae.
acuminata, Roxb.
arborea, Roxb.
cana, Roxb.
dentata,
incana, Roxb.
japonica, Thunb.
lanceolaria, Roxb.
macrophylla, Roxb.
purpurea, Roxb.
Reevesii,
villosa, Roxb.
Callistemon, R. Br. Myrtaceae.
lophanthus, Swt.
Calophyllum, Linn. Guttiferae.
attenuatum, Wall.
Inophyllum, Linn.

Calotropis, R. Br. Asclepiadeæ.
gigantea, R. Br.
procera, Ait.
Calycanthus, Linn. Calycantheæ.
floridus, Linn.
Camarotis, Lindl. Orchideæ.
purpurea, Lindl.
Camellia, Linn. Camelliae.
caudata.
japonica, Linn.
Kissi, Wall.
Campanula, Linn. Campanulaceae.
lamiifolia, Bieb.
macrantha, Fisch.
versicolor, Sm.
Camunium, Rumph. Meliaceae.
sinense, Roxb.
Canarium, Linn. Terebinthaceae.
commune, Linn.
strictum, Roxb.
Canavalia, Adans. Leguminosae.
gladiata, Dec.
obtusifolia, Dec.
virosa, W. and A.
Canella, R. Br. Guttiferae.
alba, Murr.
Canna, Linn. Scitamineae.
coccinea, Rosc.
discolor, Lindl.
flaccida, Rosc.
glauca, Linn.
indica, Roxb.
iridiflora, Hb. por.
limbata, Rosc.
nepalensis.
Cannabis, Linn. Urticeae.
sativa, Linn.
Canthium, Lam. Rubiaceae.
angustifolium, Roxb.
floribundum, Wall.
parviflorum, Lam.
recurvum.
Capparis, Linn. Capparideae,
aphylla, Roth.
brevispina, Dec.
frondosa, Jacq.
horrida, Linn.
sepiaria, Linn.
zeylanica, Linn.
Caprifolium, R. and S. Caprifoliaceae.
Periclymenum, R. and S.
Capsicum, Linn. Solaneæ.
annuum, Roxb.
baccatum, Linn.
cerasiforme, Roxb.
conicum, Lam.
frutescens, Roxb.
minimum, Roxb.
purpureum, Roxb.
Carallia, Roxb. Rhizophoreæ.
lanceaefolia, Roxb.
lucida, Roxb.
Caralluma, R. Br. Asclepiadeæ.
crenulata, Wall.
fimbriata.
umbellata, Haw.
* Cardiospermum, Linn. Sapindaceæ.
canescens, Wall.
Halicacabum, Linn.
Carduus, Linn. Compositæ.
elongatus.
marianus, Linn.
Carex, Linn. Cyperaceæ.
arenaria, Linn.
muricata, Linn.
peduncularis.
Careya, Roxb. Myrtaceæ.
arborea, Roxb.
herbacea, Roxb.
sphaerica, Roxb.
Carica, Linn. Papayeæ.
Papaya, Linn.
Carissa, Linn. Apocyneae.
Carandas, Roxb.
chinensis, Roxb.
diffusa, Roxb.
Carthamus, Linn. Compositae.
tinctorius, Linn.
* Caryota, Linn. Palmae.
? horrida, Jacq.
prolifera, Wall.
sobolifera.
urens, Roxb.
Casearia, Linn. Samydeae.
glabra, Roxb.
lanuginosa.
pentandra.
Vareca, Roxb.

Cassia, Linn. Leguminosae.
alata, Linn.
attenuata, Wall.
auriculata, Linn.
australis, B. M.
Baccillus.
bicapsularis, Linn.
biflora, Linn.
brasiliana, Lam.
Burmannia, Wall.
Chamaecrista, Linn.
corymbosa, Lam.
Fistula.
florida, Vahl.
glauca, Lam.
Kleinii, W. and A.
lanceolata, Forsk.
marilandica, Linn.
nodosa, Roxb.
occidentalis, Linn.
Senna, Lam.
Roxburghii.
sensitiva, Jacq.
Sophora, Linn.
tomentosa, Linn.
Tora, Linn.
Cassinia, Linn. Compositae.
barbara, Linn.
excelsa, Wall.
Cassytha, Linn. Cassytheae.
filiformis, Linn.
Castanea, Mill. Amentaceae.
indica, Roxb.
tribuloides, Lindl.
Castanospermum, Hook.
australe, Cun.
Casuarina, Linn. Casuarineae.
equisetifolia, Forst.
muricata, Roxb.
Cattleya, Lindl. Orchideae.
Forbesii, Lindl.
Ceanothus, Linn. Rhamneae.
macrophyllus, Wall. ?
nepalensis, Wall.
Cedrela, Linn. Meliaceae.
Toona, Roxb.
Cedrus, Barrel. Coniferae.
Deodara, Roxb.
Celastrus, Linn. Celastrineae.
emarginata, Roxb.
fascicularis, Wall.
pallida, Wall.
Celastrus, montana, Roxb.
oblonga, Wall.
paniculata, Willd.
robusta, Roxb.
stylosa, Wall.
simplicifolia, Wall.
trigyna, Roxb.
verticillata, Roxb.
* Celtis, Linn. Ulmaceae.
australis, Linn.
occidentalis, Linn.
orientalis, Linn.
tetrandra, Roxb.
Cenchrus, Linn. Gramineae.
echinatus, Linn.
quinquevalvis.
tribuloides, Linn.
Centaurea, Linn. Compositae.
bracteata, Balb.
moschata, Linn.
nigra, Linn.
nigrescens, Willd.
pratensis, Thuill.
splendens, Linn.
Centrostachys, Wall. Amarantaceae.
aquatica, Wall. ?
* Ceratostemma, Juss. Vaccineae.
vacciuaceum, Roxb.
variegatum, Roxb.
Ceratophyllum, Linn. Ceratophyllae.
verticillatum, Roxb.
Cerasus, Juss. Rosaceae.
nepalensis, Ser.
Cerbera, Linn. Apocyneae.
fruticosa, Roxb.
Manghas, Roxb.
Odollum, Roxb.
parviflora.
Thevetia, Linn.
Tanghin.
Cereus, Linn. Cacteae.
cylindricus, Haw.
flagelliformis, Haw.
grandiflorus, Haw.
hexagonus, Haw.
multangularis, Haw.
speciosissimus, Haw.
tetragonus.
Ceropegia, Linn. Asclepiadeae.
bulbosa, Roxb.
hirta, W. and A.
juncea, Roxb.

Ceropegia lucida,
ovata, Wall.
peduncularis, Wall.
sphenantha, Wall.
Cestrum, Linn. Solaneae.
fœtidissimum, Jacq.
Chamædorea, Willd. Palmae.
gracilis, Willd.
Chamaerops, Linn. Palmae.
excelsa, Thun.
Griffithiana, Wall.
humilis, Linn.
Chara, Linn. Characeae.
furcata, Roxb.
involucrata, Roxb.
verticillata, Roxb.
Cheilanthes, Swz. Filices.
farinosa, Kaulf.
Cheiranthus, Linn. Cruciferae.
Cheiri, Linn.
Chelidonium, Linn. Papaveraceae.
majus, Mil.
Chickrassia, Juss Meliaceae.
tabularis, Juss.
Chimonanthus, Lindl. Calycantheae.
fragrans, Lindl.
Chiococca, Linn. Rubiaceae.
racemosa, Linn.
Chionanthus, Linn. Oleinae.
dichotoma, Roxb.
macrophylla.
smilacifolia, Wall.
Chloranthus, Swz. Chlorantheae.
erectus Wall.
inconspicuus, Swz.
Chloris, Swz. Gramineae.
barbata, Roxb.
ciliata, Swz.
pallida, Willd.
Chlorophytum, Ker. Asphodeleae.
undulatum.
Chloroxylon, Dec. Meliaceae.
Swietenia, Dec.
Chondrospermum, Wall. Oleineae.
smilacifolium, Wall.
Chrysanthemum, Linn. Compositae.
chinense.
indicum, Linn.
Chrysobalanus, Linn. Chrysobalaneae.
Icaco, Linn.
Chrysobaphus, Wall. Orchideae.
Roxburghii, Wall.
Chrysophyllum, Linn. Sapoteae.
acuminatum, Roxb.
Cainito, Linn.
oblongum.
Cicer, Linn. Leguminosae.
aretinum, Linn.
Cichorium, Linn. Compositae.
Endivia, Linn.
Intybus, Linn.
Cinnamomum, R. Br. Laurineae.
Camphora, Swt.
Cassia, D. Don.
caudatum, Nees.
Culilawan, Swt.
dulce, G. Don.
nitidum, Hook.
obtusifolium, Nees.
verum, Swt.
zeylanicum, Blum.
Cirsium, Linn. Compositae.
horridulum, Mx.
Cirrhopetalum, Lindl. Orchideae.
cespitosum, Wall.
Lindleyii, Wall.
macrophyllum, Wall.
Cissampelos, Linn. Menispermaceae.
glabra, Roxb.
chartacea, W. and A.
hernandifolia, Wall.
Cissus, Linn. Ampelideae.
auriculata, Roxb.
bracteolata, Wall.
carnosa, Roxb.
cordata, Roxb.
elongata, Roxb.
glandulosa, Roxb.
glauca, Roxb.
lanceolaria, Roxb.
latifolia, Lam.
pedata, Roxb.
quadrangularis, Roxb.
villosa.
vitiginea, Roxb.
Citrus, Linn. Aurantiaceae.
acida, Roxb.
Aurantium, Linn.
decumana, Linn.
inermis, Roxb.
medica, Linn.
Clematis, Linn. Ranunculaceae.
cylindrica, Sims.
Gowriana, Roxb.

Clematis integrifolia, Linn.
odorata, Wall.
Viticella, Linn.
Wightiana, Wall.
Flammula, Linn.
Clausena, Burm. Aurantiaceae.
heptaphylla, W. and A.
nana, W. and A.
punctata, W. and A.
suffruticosa, W. and A.
sumatrana, W. and A.
Cleome, Linn. Capparideae.
heptaphylla, Linn.
monophylla, Linn.
Clerodendrum, Linn. Verbenaceae.
divergens, Wall.
fragrans, Vent.
hastatum, Wall.
inerme, Roxb.
nutans, Wall.
phlomoides, Linn.
pyramidale, Andr.
trichotomum, Thunb.
Clinopodium, Linn. Labiatae.
angustifolium.
incanum, Linn.
repens, Roxb.
Clitoria, Linn. Leguminosae.
brasiliana, Linn.
heterophylla, Lam.
macrophylla, Wall.
ternata, Linn.
virginiana, Linn.
Cluytia, Linn. Euphorbiaceae.
oblongifolia, Roxb.
scandens, Roxb.
semperflorens, Roxb.
spinosa, Roxb.
Clypea, Blum. Menispermeae.
hernandifolia, W. and A.
Cnemidostachys, Mart. Euphorbiaceae.
Chamelaea, Spren.
Cnestis, Juss. Terebinthaceae.
monadelpha, Roxb.
Coccoloba, Linn. Polygoneae.
uvifera, Linn.
Cocculus, Bauh. Menispermeae.
acuminatus, Dec.
cordifolius, Dec.
calophyllus, Wall.
crispus, Dec.
Cocculus laurifolius, Dec.
palmatus, Dec.
suberosus, Dec.
triandrus,
villosus, Dec.
Cocos, Linn. Palmae.
flexuosa, Mart.
nucifera, Linn.
Cochlearia, Linn. Cruciferae.
Armoracia, Linn.
Cochlospermum, Kunth. Ternstroemiaceae.
Gossypium, Dec.
Coelogyne, Lindl. Orchideae.
barbata, Wall and Griff.
cristata, Lindl.
decora, Wall.
elata.
fimbriata, Lindl.
flavida, Wall.
interrupta, Wall.
longicaulis, Wall.
maculata, Lindl.
media, Wall.
nitida, Lindl.
ocellata, Lindl.
procera, Wall.
prolifera, Lindl.
rigida,
undulata, Wall.
Wallichii, Lindl.
Coffea, Linn. Rubiaceae.
arabica, Linn.
bengalensis, Roxb.
fragrans, Wall. ?
Coix, Linn. Gramineae.
aquatica, Roxb.
barbata, Roxb.
gigantea, Koen.
heteroclita, Roxb.
Lachryma, Linn.
pumila, Roxb.
Colebrookia, Roxb. Labiatae.
oppositifolia, Roxb.
ternifolia, Roxb.
Colquhounia, Wall. Labiatae.
coccinea, Wall.
Colubrina, Rich. Rhamneae.
asiatica, Bron.
Columnea, Linn. Scrophularineae.
balsamica, Roxb.

Colutea, Linn. Leguminosae.
grandiflora.
Combretum, Linn. Combretaceae.
acuminatum, Roxb.
chinense, Roxb.
coccineum, Lam.
costatum, Roxb.
extensum, Roxb.
latifolium.
ovalifolium, Roxb.
purpureum, Vahl.
rotundifolium, Roxb.
Commelina, Linn. Commelineæ.
africana, Linn.
bengalensis, Roxb.
cespitosa, Roxb.
coelestis, Willd.
communis, Roxb.
erecta, Linn.
herbacea, Roxb.
macrorrhiza, Carey.
nana, Roxb.
nudiflora, Roxb.
salicifolia, Roxb.
scapifolia, Roxb.
tuberosa, Linn.
virginica, Linn.
Commersonia, Forst. Byttneriaceæ.
echinata, Forst.
Congea, Roxb. Verbenaceæ.
azurea, Wall.
pentandra, Wall.
Connarus, Linn. Terebinthaceæ.
ferrugineus, Jack.
igneus, Wall.
nitidus, Roxb.
Conocarpus, Linn. Combretaceæ.
acuminatus, Roxb.
latifolius, Roxb.
Convallaria, Linn. Liliaceæ.
oppositifolia, Wall.
Convolvulus, Linn. Convolvulaceæ.
arvensis, Linn.
barbatus, Wall.
floribundus, Kunth.
hederaceus, Linn.
lacteus, Wall.
macrocarpus, Linn.
malabaricus, Linn.
marginatus, Linn.
paniculatus, Roxb.
pedatus, Roxb.
Convolvulus reptans, Linn.
Turpethum, Roxb.
viscidus.
obscurus, Linn.
Conyza, Linn. Compositæ.
angustifolia, Roxb.
balsamifera, Linn.
corymbosa, Roxb.
laeta, Wall.
Cookia, Sonner. Aurantiaceæ.
pentaphylla, W. and A.
punctata, Sonner.
Corchorus, Linn. Tiliaceæ.
olitorius, Linn.
serratus, Thunb.
trilocularis, Linn.
Cordia, Linn. Cordiaceæ.
grandis, Roxb.
latifolia, Roxb.
Myxa, Linn.
reticulata, Roth.
Sebestena, Linn.
serrata, Roxb.
Coreopsis, Linn. Compositæ.
coronata, Linn.
tinctoria, Nutt.
Coriandrum, Linn. Umbilliferæ.
sativum, Linn.
Coriaria, Linn. Coriareæ.
nepalensis,
Cornucopia, Linn. Gramineæ.
cucullatum, Linn.
Cornus, Linn. Corneæ.
macrophylla, Wall.
Corynocarpus, Forst. Myrsineæ.
laevigatus, Forst.
Corypha, Linn. Palmæ.
elata, Roxb.
umbraculifera, Linn.
Cosmea, Cav. Compositæ.
parviflora, Willd.
sulphurea, Willd.
Cossignea, Comm. Sapindaceæ.
pinnata, Lam.
Cotoneaster, Med. Rosaceæ.
affinis, Lindl.
obovata, Wall.
Costus, Linn. Scitamineæ.
argyrophyllus, Wall.
nepalensis, Rosc.
speciosus, Rosc.

Cotyledon, Linn. Crassulaceæ.
articulatus.
mammillaris, Thunb.
Crassula, Linn. Crassulaceæ.
capitata, Ait.
obliqua, Ait
Crataegus, Linn. Rosaceæ.
crenulata, Lindl.
glauca.
indica, Linn.
Crataeva, Linn. Capparideæ.
Nurvala, Ham.
Roxburghii, R. Br.
Crescentia, Linn. Solaneæ ?
Cujute, Linn ,,
Crinum, Linn. Amaryllideæ.
amabile, Don.
amoenum, Roxb.
asiaticum, Linn.
augustum, Roxb.
brevifolium, Roxb.
canaliculatum, Roxb.
canalifolium, Carey.
capense, Herb.
Govenianum, Herb.
latifolium, Roxb.
longifolium, Roxb.
lorifolium, Roxb.
mauritianum, Lodd
molaccanum, Roxb.
nervosum, Roxb.
ornatum,
superbum, Roxb.
zeylanicum, Roxb.
Crotalaria, Linn. Leguminosæ.
angulosa, Roxb.
argentea, Jacq.
bialata, Roxb.
biflora, Linn.
capensis, Thunb.
elliptica, Roxb.
cuspidulata, Wall.
fulva, Roxb.
grandis,
hirsuta, Willd.
incana, Linn.
juncea, Linn.
laburnifolia, Linn.
pulcherrima, Roxb.
ramosissima, Roxb.
retusa, Linn.
Stacyana, Wall.
Crotalaria tenuifolia, Roxb.
tetragona, Roxb.
trifoliastrum, Roxb.
vasculosa, Wall.
verrucosa, Linn.
Wightiana, Grah.
Croton, Linn. Euphorbiaceæ.
drupaceum, Roxb.
elaeocarpifolium, Wall.
Joufra, Roxb.
laevigatum,
lepidotum Wall.
micradeneum, Wall.
oblongifolium, Roxb.
oxyphyllum, Wall.
plicatum, Willd.
polyandrum, Roxb.
suaveolens, Wall.
Tiglium, Linn.
variegatum, Roxb.
urophyllum, Wall.
Cryptochilus, Wall. Orchideæ.
sanguinea, Wall.
Cryptolepis, R. Br. Apocyneæ.
elegans, Wall.
reticulata, Wall.
Cucumis, Linn. Cucurbitaceæ.
Colocynthis, Linn.
Melo, Linn.
Momordica, Roxb.
sativus, Linn.
trigonus, Roxb.
utilissimus, Roxb.
Cucurbita, Linn. Cucurbitaceæ.
Citrullus, Linn.
maxima, Duch.
Cupania, Linn. Sapindaceae.
alternifolia, Pers.
canescens, Pers.
Cupressus, Linn. Coniferae.
australis, Pers.
fastigiatus,
sempervirens, Linn.
thyoides, Linn.
Curculigo, Gaert. Hypoxideae.
orchioides Roxb.
recurvata, Dry.
sumatrana, Roxb.
Curcuma, Linn. Scitamineae.
Amada, Roxb.
angustifolia, Roxb.
attenuata, Wall.

Curcuma caesia, Roxb.
coccinea,
comosa, Roxb.
cordata, Wall.
cordifolia,
elata, Roxb.
ferruginea, Roxb.
grandifolia,
latifolia, Rosc.
leucorrhiza, Roxb.
longa, Roxb.
montana, Roxb.
ornata, Wall.
parviflora,
petiolata, Roxb.
plicata,
reclinata, Roxb.
Roscoeana,
rubescens,
viridiflora, Roxb.
xanthorrhiza, Roxb.
Zedoaria, Rosc.
Zerumbet, Roxb.
Cuscuta, Linn. Cuscuteae.
aggregata, Roxb.
capitata, Roxb.
reflexa, Roxb.
sulcata, Roxb.
Cycas, Linn. Cycadeae.
circinalis, Linn.
revoluta, Thunb.
sphoerica, Roxb.
Cymbidium, Swartz. Orchideae.
aloifolium, Swz.
Gibsoni, Wall.
giganteum, Wall.
inconspicuum, Wall.
longipetalum, Wall.
Mastersii, Wall.
striatum, Wall.
triste, Willd.
Cymbopogon, Spren. Gramineae.
Schoenanthus, Spren.
Cyminosma, Gaert. Rutaceae.
pedunculatum, Dec.
Reevesi, Wall.
Cynanchum, Linn. Asclepiadeae.
paucifolium, R. Br.
Cymaria, Benth. Labiatae.
elongata,
Cynara, Linn. Compositae.
Scolymus, Linn.
Cynoglossum, Linn. Boragineae.
racemosum, Roxb.
Cynometra, Linn. Leguminosae.
cauliflora, Linn.
polyandra, Roxb.
Cyperus, Linn. Cyperaceae.
alopecuroides, Roxb.
articulatus, Roxb.
compressus, Roxb.
cruentus, Roxb.
difformis, Roxb.
distans, Roxb.
dubius, Roxb.
elatus, Roxb.
Haspan, Roxb.
inundatus, Roxb.
Iria, Roxb.
monocephalus, Roxb.
nudus,
Pangorii, Roxb.
pertenuis, Roxb.
polystachys, Roxb.
procerus, Roxb.
punctatus, Roxb.
rotundus, Roxb.
spinulosus, Roxb.
tegetus, Roxb.
tenellus, Vahl.
tenuiflorus, Roxb.
tuberosus, Roxb.
tortuosus, Roxb.
verticillatus, Roxb.
Cypripedium, Linn. Orchideae.
insigne, Wall.
venustum, Wall.
Cyrtanthus, Ait. Amaryllideae.
obliquus, Ait.
Cyrtopodium, R. Br. Orchideae.
glutiniferum, Raddi.

Dacrydium, Sol. Coniferae.
elatum, Wall.
Dahlia, Cav. Compositae.
frustranea, Ait.
superflua, Ait.
Dalbergia, Linn. Leguminosae.
emarginata, Roxb.
frondosa, Roxb.
glauca, Wall.
latifolia, Roxb.
marginata, Roxb.

Dalbergia oujeinensis, Roxb.
paniculata, Roxb.
procera,
rimosa, Roxb.
robusta, Roxb.
scandens, Roxb.
Sissoo, Roxb.
tamarindifolia, Roxb.
zeylanica, Roxb.
Dalhousiea, Grah. Leguminosæ.
bracteata, Grah.
Dalrymplea, Roxb. Celastrineæ.
pomifera, Roxb.
Dammara, Rumph. Coniferæ.
orientalis, Lamb.
Damasonium, Scp. Hydrocharideæ.
indicum, Willd.
Daphne, Linn. Thymeleaceæ.
indica, Linn.
viridiflora,
Datisca, Linn. Datisceæ.
cannabina, Linn.
Datura, Linn. Solaneæ.
fastuosa, Roxb.
ferox, Linn.
Metel, Roxb.
Stramonium, Linn.
suaveolens, Willd.
Daucus, Linn. Umbelliferæ.
Carota, Linn.
Davallia, Sm. Filices.
angustifolia, Roxb.
multiflora,
Deeringia, R. Br. Amarantaceæ.
celosioides, Roxb.
staminea, Wall.
Delima, Linn. Dilleniaceæ.
hebecarpa, Dec.
sarmentosa, Linn.
Delphinium, Linn. Ranunculaceæ.
Ajacis, Linn.
Dendrobium, Swz. Orchideæ.
aggregatum,
Calceolaria, Hook.
candidum, Wall.
chrysanthum, Wall.
clavatum,
coerulescens, Wall.
crispatum, Wall.
cuculatum, R. Br.
Dendrobium Dalhousieanum, Wall.
denudans,
fimbriatum, Hook.
flavum,
formosum, Roxb.
heterocarpum, Wall.
insigne, Wall.
Jenkinsii, Wall.
longicorne, Lindl.
moschatum, Wall.
multicaule, Wall.
Perardii, Roxb.
strictum,
uncinatum, Wall.
venustum, Wall.
villosulum, Wall.
Dentella, Forst. Rubiaceæ.
repens, Forst.
Desmanthus, Willd. Leguminosæ.
natans, Willd.
* Desmodium, Desv. Leguminosæ.
cephalotes, Wall
congestum, Wall.
diffusum, Dec.
gangeticum, Dec.
gyrans, Dec.
gyroides, Dec.
latifolium, Dec.
paniculatum, Willd.
parviflorum, Dec.
polycarpum, Dec.
triflorum, Dec.
triquetrum, Dec.
Dianella, Ker. Liliaceæ.
nemorosa, Lam.
Dianthus, Linn. Caryophylleæ.
barbatus, Linn.
Caryophyllus, Linn.
chinensis, Linn.
paniculatus,
plumarius, Linn.
suaveolens, Spren.
superbus, Linn.
Dicerma, Dec. Leguminosæ.
pulchellum, Dec.
Dichrostachys, Dec. Leguminosæ.
cinerea, W. and A.
Dicliptera, Juss. Acanthaceæ.
Roxburghiana,

Dillenia, Linn. Dilleniaceæ.
augusta, Roxb.
scabrella, Roxb.
pentagyna, Roxb.
speciosa, Thunb.
Dinetus, Swt. Convolvulaceæ.
paniculatus, Swt.
racemosus, Swt.
Dioscorea, Linn. Dioscoreæ.
aculeata, Linn.
alata, Linn.
anguina, Roxb.
atropurpurea, Roxb.
daemonum, Roxb.
pentaphylla, Linn.
purpurea, Roxb.
rubella, Roxb.
Diospyros, Linn. Ebenaceæ.
Chloroxylon, Roxb.
cordifolia, Retz.
Ebenum, Roxb.
glutinosa, Koen.
grandiflora, Wall.
Kaki, Linn.
lanceaefolia, Roxb.
Mabola, Roxb.
Melanoxylon, Roxb.
montana, Roxb.
nigricans, Wall.
racemosa, Roxb.
ramiflora, Roxb.
Sapota, Roxb.
stricta, Roxb.
tomentosa, Roxb.
vaccinioides, Lindl.
Dipsacus, Linn. Dipsaceæ.
mitis, Don.
* Dipterocarpus, Gaert. Dipterocarpeæ.
alatus, Wall.
turbinatus, Gaert.
Dischidia, R. Br. Asclepiadeæ.
lanceolata,
bengalensis,
Dodonaea, Linn. Sapindaceæ.
Burmanniana, Dec.
viscosa, Linn.
Dolichos, Linn. Leguminosæ.
brachystachys, Wall.
gangeticus, Roxb.
glutinosus, Roxb.
hexandrus,
Dolichos incanus,
mollissimus, Wall.
pilosus, Roxb.
sinensis, Linn.
speciosus, Wall.
Dombeya, Cav. Byttneriaceæ.
palmata, Cav.
tiliæfolia, Cav.
Dorstenia, Linn. Urticeæ.
Contrajerva, Linn.
Dracaena, Linn. Arphodeleæ.
angustifolia,
cernua, Jacq.
Draco, Linn.
ensiformis, Wall.
ferrea, Linn.
maculata, Roxb.
reflexa, Linn.
terminalis, Jacq.
Dracocephalum, Linn. Labiatæ
moldavicum, Linn.
Drimia, Jacq. Asphodeleæ.
acuminata, Lodd.
lanceaefolia, Ker.
media, Jacq.
Dryandra, R. Br. Proteaceæ.
oleifera,
Echinops, Linn. Compositæ.
echinatus,
Echites, Linn. Apocyneæ.
acuminata, Roxb.
antidysenterica, Roth.
caryophyllata, Roxb.
cymosa, Roxb.
dichotoma, Roxb.
macrophylla, Roxb.
paniculata, Pavi.
suberecta, Jacq.
Echium, Linn. Boragineæ.
violaceum, Linn.
Eclipta, Linn. Compositæ.
prostrata, Linn.
Ehretia, Linn. Cordiaceæ.
aspera, Roxb.
buxifolia, Roxb.
graveolens, Wall.
laevis, Roxb.
serrata,
Ekebergia, Spar. Meliaceæ.
intergerrima,

Elaeagnus, Linn. Elaeagneæ.
conferta, Roxb.
dulcis,
ferruginea, Rich.
parviflora,
triflora, Roxb.
Elaeis, Jacq. Palmæ.
guinensis, Jacq.
Elaeocarpus, Linn. Elaeocarpeæ.
acuminatus,
aristatus, Roxb.
Ganitrus, Roxb.
longifolius, Blum.
lucidus, Roxb.
rugosus, Roxb.
serratus, Roxb.
integrifolius,
Elaeodendron, Jacq. Celastrineæ.
orientale, Jacq.
Roxburghii, W. and A.
Elatine, Linn. Elatineæ.
ammannoides, W. and A.
verticillata, W. and A.
Elephantopus, Linn. Compositæ.
scabra, Linn.
Eleusine, Gaert. Gramineæ.
aegyptica, Roxb.
calycina, Roxb.
coracana, Roxb.
indica, Roxb.
stricta, Roxb.
verticillata,
virgata,
Elytraria, Mx. Acanthaceae.
crenata, Vahl.
Embelia, Burm. Myrsineae.
garcinifolia, Wall.
nutans, Wall.
Ribes Roxb.
robusta, Roxb.

Emblica, Gaert. Euphorbiaceae.
officinalis, Gaert.

Enhydra, Dec. Compositae.
repens, Dec.
Entada. Adans. Leguminosae.
polystachya, Dec.
Pursaetha, Dec.
stipulata,

Epidendrum, Linn. Orchideae.
ciliare, Linn.
cochleatum, Linn.
crassifolium, Lindl
ellipticum, Hook.
fragrans, Swz.
moschatum,
odoratissimum, Lindl.
pygmæum,
Epipactis, Rich. Orchideae.
plicata, Roxb.
Epiphyllum, Haw. Cacteae.
truncatum, Haw.
Eranthemum, Linn. Acanthaceae.
azureum, Wall.
pulchellum, Roxb.
palatiferum, Wall.
strictum, Roxb.
suffruticosum, Roxb.
Eria, Lindl. Orchideae.
annulata, Wall.
clavicaulis, Wall ?
densiflora, Wall.
excavata,
grandiflora, Wall.
longipes,
paniculata, Lindl.
planicaulis, Wall.
pusilla,
ramosissima, Wall.
Eriobotrya, Lindl. Rosaceae.
japonica, Lindl.
Eriochlaena, Dec. Byttneriaceae.
Wallichii, Dec.
* Erysimum, Linn. Cruciferae.
canescens, Roth.
Wadeanum, Wall.
* Erodium, Herit. Geraniaceae.
moschatum, Willd.
malachoides, Willd.
Erythrina, Linn. Leguminosae.
glauca, Willd.
herbacea, Linn.
indica, Linn.
Erythroxylon, Linn. Erythroxyleae.
longifolium, Lam.
laurifolium, Lam.
Eucalyptus, Herit. Myrtaceae.
piperita, Linn.
resinifera, Sm.

Euchroma, Nut. Scrophularineae.
coccineum, Nut.
Eugenia, Linn. Myrtaceae.
acuminata, Roxb.
acris, W. and A.
balsamica, Jacq.
microphylla, Wall.
brachiata, Roxb.
polypetala, Wall.
buxifolia, Lam.
caryophyllata, Willd.
claviflora, Roxb.
lanceolaria, Roxb.
myrtifolia, Ker.
oleina, Wall.
Eulophia, R. Br. Orchideae.
campestris, Wall.
exaltata, Griff.
fusca, Wall.
lurida, Lindl.
tristis, Spren.
virens, R. Br.
Euonymus, Linn. Celastrineae.
atropurpureus, Roxb.
bullatus, B. M.
garcinifolius, Roxb.
glabra, Roxb.
grandiflorus, Wall.
grossus, Wall.
oliflorus, Wall.
scandens, Hort.
lanceolatus, Wall.
Eupatorium, Linn. Compositae.
asperum, Roxb.
Aya pana, Vent.
bracteolatum, Wall.
candicans,
dentatum,
divergens, Roxb.
diversiflorum,
repandum, Willd.
vagans,
Euphorbia, Linn. Euphorbiaceae.
antiquornm, Linn.
arborescens,
Chamaesyce, Linn.
hirta, Jacq.
hoyæfolia,
linifolia, Vahl.
lophagona, Lam.
pyrifolia, Lam.
Euphorbia splendens, Bojer ?
Tirucalli, Linn.
trigona, Haw.
Euphoria, Comm. Sapindaceae.
Litchi, Desf.
Longana, Lam.
Nephelium, Dec.
verticillata, B. R.
Euryale, Sal. Nymphæaceae.
ferox, Sal.

Faba, Adams. Leguminosae.
vulgaris, Moen.
Fagara, Linn. Xanthoxyleae.
Budrunga, Roxb,
floribunda, Wall.
nitida, Roxb.
triphylla, Roxb.
undulata, Wall.
violacea,
Fagraea, Thunb. Apocyneae.
obovata, Wall.
Feronia, Corr. Aurantiaceae.
Elephantum, Corr.
Ferraria, Linn. Irideae.
undulata, Linn.
Ficus, Linn. Urticeae.
artocarpifolius, Wall.
albinervis, Wall.
bullatus, Wall.
biglandulosa, Wall.
Carica, Linn.
congesta,
conglomerata, Roxb.
cordifolia, Roxb.
cunea, Buch.
elastica, Roxb.
erythrophylla, Wall.
excelsa, Vahl.
glomerata, Roxb.
heterophylla, Linn.
hirta, Roxb.
indica, Vahl.
infectoria, Willd.
laccifera, Roxb.
lanceolaria,
lucida, H. K.
macrophylla, Desf.
nitida, Thumb.
oppositifolia, Roxb.

Ficus pilulifera, Wall.
pisifera, Wall.
quercifolia, Roxb.
mangifolia, Wall.
radicans, Roxb.
religiosa, Linn.
repandula,
repens, Willd.
scabrida, Wall.
scandens, Roxb.
urophylla, Wall.
vagans, Roxb.
virgata, Roxb.
xylophylla, Wall.
Flacourtia, Herit. Flacourtianeae.
Cataphracta, Roxb.
cordifolia, Roxb.
ferox,
inermis, Roxb.
rotundifolia, Roxb.
sapida, Roxb.
sepiaria, Roxb.
nivea ?
Flagellaria, Linn. Commelinaceae.
indica, Linn.
Flemingia, Roxb. Leguminosae.
congesta, Roxb.
cordifolia, Wall.
nana, Roxb.
populifera, Wall.
semialata, Roxb.
strobilifera, R. Br.
Flindersia, R. Br. Meliaceae.
australis, R. Br.
Foeniculum, Adans. Umbelliferae.
Panmorium, Dec.
vulgare, Gaert.
Foetidia, Comm. Myrtaceae.
mauritiana, Lam.
Fragaria, Linn. Rosaceae.
vesca, Linn.
Fraxinus, Linn. Oleineae.
chinensis, Roxb.
excelsior, Willd.
Funkia, Spren. Hemarocallideae.
subcordata, Spren.
ovata, Spren.

Gaertnera, Roxb. Malpighiaceae,
obtusifolia, Roxb.
Galactodendron, Henth. Urticeae.
Humboldtii,
Galedupa, Lam. Leguminosae.
bijuga,
marginata, Roxb.
Galega, Linn. Leguminosae.
Heyniana, Roxb.
incana, Roxb.
Galeum, Linn. Rubiaceae.
aparinum, Linn.
Garcinia, Linn. Guttiferae.
Boobicowa,
Cambogia, Dec.
cornea, Linn.
Cowa, Roxb.
Kydia, Roxb.
lanceaefolia, Roxb.
Mangastana, Linn.
paniculata, Roxb.
pedunculata, Roxb.
purpurea, Roxb.
Gardenia, Linn. Rubiaceae.
campanulata, Roxb.
chinensis, Spren.
costata, Roxb.
densa, Wall.
enneandra, Koen.
florida, Roxb.
gummifera, Linn.
lucida, Roxb.
rigida, Ham.
Rothmannia, Linn.
Thunbergia, Linn.
turgida, Roxb.
Gardneria, Wall. Loganeae.
ovata, Wall.
Gastonia, Comm. Araliaceae.
palmata Wall.
spongiosa Comm.
Gastrochilus, Wall. Scitamineae.
affinis, Wall.
longiflora, Wall.
pulcherrima, Wall.
* Gelonium, Roxb. Euphorbiaceae.
bifarium, Roxb.
fasciculatum, Roxb.
Genista, Linn. Leguminosae.
juncea, Linn. ?
Geodorum, Jackson, Orchideae.
candidum,
dilatatum, R. Br.
pallidum, Don.
* Geranium, Linn. Geraniaceae.
nepalense Swt.

Gerardia, Linn. Scrophularineae.
delphinifolia, Linn.
Getonia, Roxb. Combretaceae.
nutans, Roxb.
Gilia, R. and P. Polemoniaceae.
capitata, Hook.
Gilibertia, R. and P. Araliaceae.
heterophylla,
Glaucium, Taurn. Papaveraceae.
corniculatum, Curt.
Gleditschia, Linn. Leguminosae.
fera,
macracantha, Desf.
triacantha, Linn.
Globba, Spren. Scitamineae.
bracteolata, Wall.
Careyana, Roxb.
expansa, Wall.
spatulata, Roxb.
subulata, Roxb.
velutina, Wall.
Gloriosa, Linn. Liliaceae.
superba, Linn.
Glossospermum, Wall. Byttneriacae ?
velutinum, Wall ?
Gloxinia, Herit. Gesnereae.
speciosa, R. Br.
Glycine, Linn. Leguminosae.
chinensis,
dilecta, Wall.
filiformis,
Wightii, Wall.
involucrata. Wall.
labialis, Linn.
pentandra, Roxb.
Glycosmis, Corr. Aurantiaceae.
citrifolia, W. and A.
pentaphylla, Dec.
Gmelina, Linn. Verbenaceae.
arborea, Roxb.
macrophylla,
parviflora, Roxb.
villosa, Roxb.
Gnetum, Linn. Urticeae.
Gnemon, Linn.
scandens Roxb.
Goldfussia, N. E. Acanthaceae.
anisophylla,
glomerata Nees.
isophylla Nees.
lamiifolia, Nees.
Gomphostemma, Wall. Labiatae.
lucidum, Wall.
Gomphrena, Linn. Amaranthaceae.
decumbens, Jacq.
globosa, Linn.
Goodyera, R. Br. Orchideae.
discolor, B. Reg.
Gossypium, Linn. Malvaceae.
acuminatum, Roxb.
album, Ham.
arboreum, Linn.
nigrans, Ham.
religiosum, Swz.
Gouania, Linn. Rhamneae.
leptostachya, Dec.
nepalensis,
Gramatophyllum, Blum. Orchideae.
Finlaysonianum, Lindl.
Gratiola, Linn. Scrophularineae.
reptans, Roxb.
serrata, Roxb.
Grewia, Linn. Tiliaceae.
asiatica, Linn.
aspera, Roth.
carpinifolia, Juss.
denticulata, Wall.
floribunda, Wall.
humilis, Wall.
microstemma, Wall.
Microcos, Linn.
occidentalis, Linn.
oppositifolia, Ham.
orientalis, Linn.
ovalifolia Juss.
sapida, Roxb.
scabrophylla, Roxb.
sepiaria, Roxb.
tomentosa, Juss.
umbellata, Roxb.
viminea, Wall.
Grislea, Linn. Salicarieae.
tomentosa, Roxb.
Guaiacum, Linn. Zygophylleae.
officinale, Linn.
Guarea, Roxb. Meliaceae.
binectarifera, Roxb.
mollis, Wall.
Guatteria, R. and P. Anonaceae.
Badajamba, Wall.
cerasoides, Dunal.
longifolia, Wall.

Guatteria suberosa, Dunal.
velutina, Dec.
Guazuma, Plum. Sterculiaceae.
ulmifolia, Lam.
Guettardia, Linn. Rubiaceae.
speciosa, Linn.
Guilandina, Linn. Leguminosae.
Bonduc, Linn.
Gymnema, R. Br. Asclepiadeae.
acuminatum,
nepalense,
parviflorum,
pubijerum, Wall.
sparteum,
tingens, Spren.
tenacissimum, Spren.
Gymnocladus, Lam. Leguminosae.
canadensis, Lam.
Gynandropsis, Dec. Capparideae.
pentaphylla, Dec.
Gyrocarpus, Jacq. Illigereae.
asiaticus, Willd.

* Habranthus, Herb. Amaryllideae.
angustus, Herb.
robustus,
Haemanthus, Linn. Amaryllideae.
ciliaris,
coccineus, Linn.
pubescens, Linn.
toxicarius,
Haematoxylon, Linn. Leguminosae.
campechianum, Linn.
Hardwickia, Roxb. Leguminosae.
binata, Roxb.
pinnata, Roxb.
Harpullia, Roxb. Sapindaceae.
cupanioides, Roxb.
Hedera, Linn. Araliaceae.
confleum, Wall.
Hedychium, Koen. Scitamineae.
acuminatum, Rosc.
angustifolium, Roxb.
barbatum, Wall.
coccineum, Rosc.
candidum, Wall.
coronarium, Roxb.
elatum, R. Br.
ellipticum, Sm.
fastigiatum, Wall.
flavescens, Lodd.
Gardnerianum, Wall.
Hedychium gratum, Wall.
maximum, Rosc.
spicatum, B. M.
sulphureum,
thyrsiforme, Haw.
Hedyotis, Linn. Rubiaceae.
aspera, Heyne.
hispida, Roxb.
Hedysarum Linn. Leguminosae.
amoenum,
bracteatum, Roxb.
divergens,
ellipticum,
serpens, Wall.
Heimia, Link. Salicarieae.
myrtifolia.
Helianthus, Linn. Compositae.
annus, Linn
tuberosus, Linn.
Heliconia, Schreb. Musaceae.
indica, Lam.
Helicteres, Linn. Bombaceae.
angustifolia,
elongata, H. C.
Isora, Linn.
pulchella, Wall ?
spicata, Coleb.
virgata, Wall.
Heliopsis, Pers. Compositae.
laevis, Pers.
Heliotropium Linn. Boragineae.
curassavicum, Linn.
indicum, Roxb.
parviflorum, Linn.
peruvianum, Linn.
Hemidesmus, R. Br. Asclepiadeae.
tetraphyllus,
Hemerocallis, Linn. Hemerocallideae.
fulva, Linn.
Hemionitis, Linn. Filices.
cordifolia, Roxb.
Heritiera, Ait. Byttneriaceae.
macrophylla, Wall ?
minor, Roxb.
Hernandia, Linn. Hernandieae.
ovigera, Linn.
Heteropogon, Beauv. Gramineae.
contortus, Beauv.
Heynia, Roxb. Meliaceae.
affinis, Juss.
quinquejuga, Roxb.

Hibiscus Linn. Malvaceae.
albus,
cannabinus, Linn.
chinensis,
diversifolius, Jacq.
eriocarpus, Dec.
furcatus, Roxb.
heterophyllus, Ven.
Lampas, Cav.
Lindleyi, Wall.
longifolius, Willd.
lunarifolius, Willd.
macrophyllus, Roxb.
mutabilis, Linn.
palustris, Linn.
phoeniceus, Willd.
prostratus, Roxb.
radiatus, Cav.
Rosa-sinensis, Linn.
Sabdariffa, Linn.
scandens, Roxb.
sulphureus,
surattensis, Linn.
syriacus, Linn.
tortuosus, Roxb.
Trionum, Linn.
Hieracium, Linn. Compositae.
cymosum, Linn.
Hippeastrum, Herb. Amaryllideae.
acuminatum,
Johnsonii,
pulverulentum,
solandrifolium,
spathaceum,
Hippocratea, Linn. Hippocrateaceae.
arborea, Roxb.
indica, Willd.
obtusifolia, Roxb.
viminea,
Hiptage, Gaert. Malpighiaceae.
Madablota, Gaert.
Hiraea, Schreb. Malpighiaceae.
hirsuta,
nepalensis,
nutans, Roxb.
Hitchenia, Wall. Scitamineae.
glauca, Wall.
Holarrhena, R. Br. Apocyneae.
villosa,
Holigarna, Roxb. Terebinthaceae.
longifolia, Roxb.
racemosa, Roxb.
Holboellia, Wall. Lardizabaleæ.
latifolia, Wall ?
Holmskioldia, Retz. Labiatae.
sanguinea, Retz.
Hordeum, Linn. Gramineae.
distichon, Linn.
hexastichon, Linn.
vulgare, Linn.
Houttuynia, Thunb. Saurareae.
cordata, Thunb.
Hovenia, Thunb. Rhamneae.
inaequalis, Dec.
Hoya, R. Br. Asclepiadeae.
carnosa, R. Br.
fusca, "
lanceolata,
linearis,
parasitica,
Humea, Sm. Compositae.
elata,
Hura, Linn. Euphorbiaceae.
crepitans, Linn.
Hyalostemma, Wall. Anonaceae.
Roxburghianum, Wall.
Hydrangea, Linn. Saxafrageae.
hortensis, Sm.
mutabilis,
Hydrocotyle, Linn. Umbelliferae.
asiatica, Linn.
nepalensis, Hook.
vulgaris, Linn.
Hymenaea, Linn. Leguminosae
Courbaril, Linn.
Hymenodictyon, Wall. Rubiaceae.
thyrsiflorum, Wall.
Hymenopyramis, Wall. Verbenaceae.
brachiata, Wall.
Hyoscyamus, Linn. Solaneae.
niger, Linn.
Hypericum, Linn. Hypericineae.
chinense, Linn.
Hypoestes, Soland. Acanthaceae.
purpurea. R. Br.
Hypoxis, Linn. Hypoxideae.
ovata, Willd.
Hyptianthera, W. and A. Rubiaceae.
stricta, W. and A.
Hyssopus, Linn. Labiatae.
officinalis, Linn.

Ichnocarpus, R. Br. Apocyneae.
fragrans,

(To be continued.)

Monthly Proceedings of the Society.

(Wednesday, the 10th January, 1844.)

The Hon'ble Sir J. P. Grant, President, in the Chair.

George Jephson, Esq. who was proposed at the last Meeting, was duly elected a Member of the Society.

For Election.

The names of the following gentlemen were submitted as candidates for election :—

R. M. Stephenson, Esq. proposed by Col. Forbes, seconded by Mr. Piddington.

William Dampier, Esq. Civil Service, proposed by the Honorable Mr. Maddock, seconded by Mr. Henry Moore.

R. Farquharson, Esq. Civil Service, proposed by Mr. William St. Quintin, seconded by Mr. E. Jenkins.

K. H. Hewett, Esq. proposed by Mr. Quintin, seconded by Mr. Jenkins.

George Massey, Esq. Merchant, Calcutta, proposed by Mr. J. S. Stopford, seconded by Dr. William Griffith.

William Hammil, Esq. Merchant, Calcutta, proposed by Mr. William Storm, seconded by Mr. H. W. Lake.

James Campbell Shaw, Esq. proposed by Mr. J. W. Roberts, seconded by the Secretary.

J. H. Miller, Esq. Bowaneepore, proposed by Mr. Wale Byrne, seconded by Mr. George Wood.

Presentations to the Library.

1. Five copies of a Report on the Honorable Company's Botanic Garden, Calcutta, Parts I. V. VI. and VII. By William Griffith, Esq. Officiating Superintendent.—*Presented by Government.*

2. Proceedings of the Ceylon Agricultural Society, for the half year, ending the 1st of July, 1843.—*Presented by the Society.*

3. Report of the Bombay Chamber of Commerce, for the 1st quarter of 1843-44.—*Presented by the Chamber.*

4. Journal of the Asiatic Society of Bengal, Nos. 55, 56 and 57, in continuation.—*Presented by the Society.*

5. The India Review and Journal of Foreign Science and the Arts, No. VII. of Vol. 1.—*Presented by the Proprietor.*

6. Report of the Sudder Dewany Adawlut N. W. Provinces; of the administration of Civil Justice, for the year 1841.—*Presented by the Govt. of N. W. Provinces.*

7. The India Journal of Medical and Physical Science, No. XII. of Vol. 1.—*Presented by the Proprietor.*

Election of Office Bearers.

The Hon'ble the President intimated, that this being the Anniversary Meeting, it was necessary that the election of Office Bearers for the current year should be entered on. The Members accordingly proceeded to the election, and appointed Dr. Huffnagle to be the Scrutineer, who reported that all the Officers of the preceding year were re-elected, as follow:—

The Hon'ble Sir John Peter Grant, *President.*

C. K. Robison, Esq.
William Griffith, Esq.
Baboo Ramcomul Sen.
Baboo Dwarkanauth Tagore.
} *Vice-Presidents.*

James Hume, Esq., *Honorary Secretary.*

A. H. Blechynden, Esq., *Deputy Secretary and Collector.*

Standing Committees.

The election of Members to serve on the Standing Committees of the Society, for the current year, was next taken into consideration. The Secretary mentioned, that the departure for Europe of Mr. Hodgkinson, and the absence of Dr. Corbyn in the N. W. Provinces, had created vacancies in the Committees for Sugar, Caoutchouc and Oil Seeds, and the Nursery Garden. Mr. Huffnagle also informed the Meeting, that as the distance of his residence prevented his joining at the Meetings of the Garden Committee, he would wish his name to be withdrawn therefrom.

It was accordingly proposed by Mr. William Storm, and unanimously resolved, that Messrs. H. W. Lake and T. H. Lakin be Members of the Garden Committee in the room of Messrs. Huffnagle and Hodgkinson.

It was further proposed by the Secretary and agreed, that Mr. James Cowell be requested to fill the vacancy in the Sugar Committee.

It was next proposed by Mr. Huffnagle and resolved, that Mr. William Haworth be invited to fill the vacancy in the Committee for Caoutchouc and Oil Seeds, caused by the departure of Dr. Corbyn.

On the motion of the President it was unanimously resolved, that Drs. Mouat and Griffith be requested to add their names to the Caoutchouc, &c. Committee, with a view to increase its efficiency.

All the other Members were re-elected to their respective Committees, which, with the above additions, stand as follows :—

Sugar.—Messrs. G. U. Adam, John Allan, H. Piddington and James Cowell.

Cotton.—Messrs. Joseph Willis, Charles Huffnagle, W. Earle, G. U. Adam and Robert Smith.

Silk, Hemp and Flax.—Messrs. R. Watson, J. Willis, C. K Robison, G. T. F. Speede and Baboo Ramcomul Sen.

Coffee and Tobacco.—Dr. Strong and Mr. Piddington.

Implements of Husbandry.—Col. Forbes, Messrs. C. K. Robison and Charles Huffnagle, Baboo Ramcomul Sen, and Rajah Radhakant Deb, Bahadoor.

Caoutchouc and Oil Seeds.—Mr. W. Haworth, Drs. Mouat and Griffith, Baboo Ramcomul Sen, and Rajah Radhakant Deb, Bahadoor.

Improvement of Cattle.—Messrs. Charles Huffnagle, C. R. Prinsep, W. P. Grant, C. K. Robison and William Storm.

Nursery Committee.—Dr. Griffith, Messrs. William Storm, Thomas Hugon, H. W. Lake and T. H. Lakin.

Fruit and Kitchen Garden Committee.—Messrs. W. Storm, H. Piddington, G. T. F. Speede, and Baboo Ramcomul Sen.

Committee of Papers.—Drs. Mouat and Griffith, and Mr. M. A. Bignell.

Finance Committee.—Messrs. Huffnagle, Staunton and Baboo Ramcomul Sen.

General Committee.—Dr. Strong, Baboo Radhamadhub Banoorjee, Messrs. Willis and William Storm.

Annual Reports.

The Annual Report of work done by the Society during the past year, was then submitted, and referred to the Committee of Papers. A Report from the Finance Committee giving the result of the operations of the Society in its finance department during 1843, was also read, and several statements connected therewith were laid on the table. The Reports were confirmed, and will appear in the Journal.

Indian Wheat Question.

A Report from the Wheat Committee, agreed on at a Meeting held on the 8th instant, and in continuation of former reports on the subject, was submitted, together with the replies which had been received to the Committee's enquiries. The report is as follows :—

Report of the Wheat Committee.

The Wheat Committee having considered the question submitted to them, are of opinion, that it is one of the highest importance as affecting the interests of this country, and beg to recommend the Society to nominate a Committee for the purpose of preparing Memorials to the Board of Controul and Court of Directors, urging the admission of corresponding advantages to Grain from this country, as have already been conceded to that from Canada.

(Signed) William Storm,
" James Hume,
" G. T. F. Speede,
" C. R. Prinsep,
" Robert J. Lattey.

On the motion of the President it was resolved, that it be referred to the Committee to submit a further report to the Society, embodying an abstract of the information contained in the papers now laid before the Meeting.

Provision for Garden and Flower Seeds for 1844.—*Horticultural Exhibition in January.*

The next report submitted was from the Fruit and Kitchen Garden Committee, in accordance with the resolution passed at the last Meeting. The Committee state, that they have duly considered the subject referred to them, and now beg to append lists of the seeds, vegetable and flower, ordered from England, America and the Cape, together with a memorandum, showing the cost of each invoice and the total amount of the whole consignment, which the Committee observe, is ninety Rupees more than the amount voted, because it was deemed desirable to add a little to the sum reserved for a supply of flower seeds from England, in order to make the assortment as complete as possible. The Committee suggest, that an interchange of seed be effected between this Society and the Branch Society at Bhauglepore, the produce of their respective gardens.

The Committee close their report by furnishing lists of the prizes to be awarded at the exhibition on the 13th January for the best specimens of foreign and indigenous vegetables and fruits, amounting to 132 Rupees and four Silver Medals. The report was duly confirmed.

The Metcalfe Hall.

The paper that was next read was a report of the proceedings of the Finance Committee in the question of furniture for the apartments of the Society in the Metcalfe Hall. The Committee state that, having previously visited the building, they took into consideration the quantity of furniture that would be required, that they agreed on the list appended to their report, and requested the Secretary to obtain estimates from the Cabinet Makers of the cost thereof, for submission at the present meeting.

The Secretary laid on the table several estimates which he had received in accordance with the requisition of the Committee. Whereupon it was agreed, that the Committee be requested to make the best arrangements in regard to the furniture required, and that a sum not exceeding seventeen hundred Rupees be placed at their disposal for that purpose.

Proposed transfer of Prize offered for encouraging Tree Cultivation in the Upper Provinces.

The Secretary mentioned, that it would be in the recollection of the Members, that some time ago a prize of a Gold Medal and three hundred Rupees was placed at the disposal of the Society by Mr. H. C. Tucker, to be awarded to the person who should shew the largest new plantation of trees in the Agra Presidency, at the close of the year 1842. This offer had been frequently brought to public notice, but up to the present time, no claimant for it had appeared. He now begged to submit the following communication from Mr. Tucker on the subject:—

To the Secretary of the Agri-Horticultural Society of India.

Sir,—I have to return you my thanks for the back numbers of the Journal, which I have read with much interest. It is painful to see the extreme apathy which exists, relative to agricultural improvements. Who could have supposed that my Medal and Rupees 300 for Tree-planting, would have remained unclaimed to the present time! Is there any prospect of any one coming forward *now?* If not, will it not be better to divert the Prize to some other object of agricultural utility?

To three of these desiderata, I would beg to draw the attention of the Society.

1st.—A good *vernacular* Hand-book of Agriculture, Horticulture and Farming, suited to natives of India; giving them practical hints on the improvement of produce by change of seed, rotation of crops, artificial

grasses, the feeding of cattle, &c. &c., with a brief explanation of the *rationale*. Such a work would also form a useful School-book. I should give the preference to the Hindostanee Persian character, as the vernacular, and character most widely used by respectable natives.

2nd.—The best practical paper on the *Oosur plains* of the N. W. Provinces, giving their chemical analysis; the substances in which they are redundant and deficient; the best and cheapest means of removing, or neutralizing the former, and supplying the latter, *i. e.* the proper manure for such lands; the vegetable products, indigenous or foreign for which they are best adapted; the merchantable articles derivable from them; in short, the best means of bringing them under cultivation, or of otherwise rendering them available to increase the assets of the country. The settlement for 30 years having been concluded, any improvement of these barren plains will be clear gain to the people.

3rd.—The erection and working of a full-sized *Windmill*, either for crushing sugar-cane and oil-seeds, grinding corn, raising water for irrigation, draining *jheels,* or any other useful agricultural purpose. The mill should be of the cheapest material, and simplest construction, so as to serve as a model for the natives. India, from its strong periodical winds, seems peculiarly adapted for the use of wind power; and I feel sure, that a good cheap windmill once established, would be quickly and extensively imitated.

Should the Society be of opinion that there is no hope of advantage from the continued exhibition of a Prize for Tree-planting, I would beg that my Medal and Rs. 300 may be transferred, and offered for whichever of the objects noted above the Society may consider most likely to lead to practical good. I leave the decision of this point, and of the details of the notification, to the judgment of the Society.

With every best wish that, in native phrase, "the shadow of the Society may be increased,"

I have, &c.

(Signed) H. Carre Tucker.

Pinnance, near Moorshedabad,
15th December, 1843.

Resolved.—That Mr. Tucker's communication be referred to the Committee of Papers for report.

Read a letter from Mr. Groom, Florist, of Clapham Rise, near London, giving some directions for the cultivation of bulbous and tuberous plants.

The thanks of the Society were given to Mr. Groom, and his communication was referred to the Committee of Papers.

Mr. Storm presented a few apricots grown in his garden, at Chandani, near Calcutta.

Captain E. P. Nisbet, commander of the *Agincourt*, was unanimously elected a free Member of the Society, on the proposition of Mr. Staunton, seconded by Mr. Huffnagle.

In consequence of the lateness of the hour, several communications and presentations were retained for the next Meeting.

(Wednesday, the 14th of February, 1841.)

William Griffith, Esq. Vice President, in the chair.

The gentlemen proposed at the last Meeting were duly elected Members of the Society; viz.

Messrs. R. M. Stephenson, William Dampier, R. Farquharson, K. H. Hewett, George Massey, William Hammil, James Campbell Shaw, and J. H. Miller.

The names of the following gentlemen were submitted as candidates for election :—

George Edward Edmonstone, Esq. of the Civil Service, proposed by Mr. Thos. Tonnochy, seconded by the Secretary.

R. V. Thurburn, Esq. Kishnaghur, proposed by Mr. John Storm, seconded by the Secretary.

Presentations to the Library.

1. Calcutta Journal of Natural History, &c. No. 16.—*Presented by Dr. McClelland.*

2. Journal of the Asiatic Society of Bengal, No. 58.—*Presented by the Society.*

3. The India Journal of Medical and Physical Science, No. 1 of vol. 2.—*Presented by the Proprietor.*

4. The Calcutta Literary Gleaner, No. 12 of vol. 2.—*Presented by the Proprietor.*

Garden.

1. A pomegranate tree from his garden at Serampore.—*Presented by Capt. Earle.*

Capt. Earle mentions, that this layer is taken from the tree which produced the very superior specimens submitted by him at the general meeting of the Society in October last.

2. Two small cacoa plants from Capt. Marquard's garden at Chittagong.—*Forwarded by A. Sconce, Esq.* Mr. Sconce promises to send a good supply of plants at the close of the year when the pods will be ripe.

The Secretary stated, that these plants had reached in a very sickly state, and were immediately transferred to the Society's garden.

3. A further supply of capsicums, the produce of his garden at Dinapore.—*Presented by Mr. Burnell.*

Mr. Burnell observes, that these are much larger than the capsicums he presented last year to the Society. The seed is available to Members.

4. A few seeds of a variety of melon, (Cucumis dudaim,) received by the last mail.—*Presented by John Stikeman, Esq.*

Mr. Stikeman states that this melon is grown in England as a curiosity: it is the size of an orange, possesses a thin but firm rind, and is very fleshy and palatable.

The Secretary intimated that he had distributed these few seeds to parties who were likely to give every attention to the culture of the plant.

5. A very perfect bunch of grapes, the produce of a vine growing in the compound of his residence in Calcutta.—*Presented by W. Storm, Esq.*

Mr. Storm intimates, that this vine was pruned in September, and the grapes are now all ripe. The vines which he pruned in Nov. and Dec., Mr. Storm observes, do not show any blossom or hardly any leaves yet, which is attributed to the lateness of the cold season.

6. A quantity of vine cuttings of the black and white Bidana vine, and of the Muscatelle and Hubshee, the produce of the Lucknow Society's garden.—*Forwarded by Captain G. E. Hollings.*

7. A small supply of English asparagus seed.—*Presented by Major T. E. A. Napleton.*

8. A further supply of Tinnevelly Senna seed.—*Presented by James Cowell, Esq.*

9. A basket of the superior sweet potatoe of Mauritius, the produce of the Society's garden, was placed on the table. The Secretary mentioned, that about three and a half cottahs of ground are now occupied with this useful vegetable, all produced from the three plants which were presented by Mr. Henley in July last.

Museum.

1. Sample of oil expressed from the country almond.—*Presented by A. T. Smith, Esq.*

2. Samples of flax from Monghyr.—*Presented by Mr. J. Wallace.*

3. Two pieces of cloth of a very delicate texture, manufactured from the fibre of the pine-apple and of the Senseviera Zeylanica, with samples of fibre in a dyed state.—*Presented by Miss Davy.*

(Further particulars regarding the above presentations will be found in the body of the Proceedings.)

4. Specimens of Indian, American, Cape and French flours.—*Presented by the Secretary, on behalf of a Correspondent.*

The Secretary informed the Meeting, that Mr. Wood, Superintendent of the Strand Mills, had favored him with his opinion on these samples. The American flour he considers to be the finest in *color*, while the French is the *best dressed*: but neither of them are in so healthy a state as the Indian sample. Mr. Wood observes, that East Indian Wheat will make as good flour for bread, *in point of flavor*, as the Cape produce, and the *color* can be much improved, though in this respect it is not likely to be made equal to Cape flour, but on an average, the wheat of the former country is as full grained as that of the latter. Mr. Wood adds, that it would not prove of much advantage to get wheat seed from the Cape for culture in India, but the importation of seed for that purpose from N. S. Wales would be likely to be very beneficial to this country.

5. Sample of the wood of the Dalbergia lanceolaria, and an assortment of seeds of cocoa, nutmeg, &c. the produce of the Royal Botanic Garden at Peradinéa, near Kandy.—*Presented by J. C. Ondaatje, Esq. Acting Superintendent.*

6. Sample of cotton, the produce of his garden at Buxar, from acclimated seed.—*Presented by Capt. S. B. Goad.*

7. Samples of cotton grown at Jaffna, Ceylon, from New Orleans and Bourbon seed.—*Presented by the Hon'ble T. H. Maddock, Esq.*

The Secretary intimated that he had been favored by Mr. Willis, Chairman of the Cotton Committee, with a detailed report on these samples. Mr. Willis thinks highly of the quality of the Bourbon Cotton, but considers the New Orleans to be an inferior specimen. The former is valued at from 5½*d.* to 6*d.* per lb., the latter at 3*d.* to 3½*d* per lb.

8. A plough and a cultivator, manufactured at Agra, under his superintendence.—*Presented by T. J. Finnie, Esq.*

9. A very neatly finished plan of the Garden of the Bhauglepore Branch Society.—*Presented by Major Napleton, on the part of the Society.*

Indian Wheat Question.

A long tabular statement and report, founded on the information obtained by the Wheat Committee, and prepared in accordance with the

resolution passed at the last meeting, were placed on the table. The Secretary stated, that these papers had not yet received sufficient consideration at the hands of the Committee to admit of his reading them on the present occasion. He merely alluded to the circumstance to shew that some progress had been made, and in order to enable the meeting to come to some resolution with the view of considering this important question before the next *general* meeting of the Society.

After some little discussion, it was moved by Dr. Griffith, seconded by Mr. Lakin, and resolved, that a *Special* meeting of the Society be held so soon as circumstances will admit, to receive and take into consideration the report of the Wheat Committee, and that the Secretary give due notice of the same.

Adjudication of Prizes for Cattle.

The next paper submitted was the following Report of the Cattle Committee :—

The Committee appointed to arrange for the Cattle Show of 1844, beg leave to report, that the exhibition took place at the Town Hall premises on the 1st of February.

Members of the Committee present.

Messrs. C. R. Prinsep, Charles Huffnagle, and James Hume.

Mr. John Hughes was requested to assist the Committee in their selections.

The following awards were then made.—

Imported Neat Cattle.

For the Prize offered for the best specially imported Bull of the year 1843, a Roan Bull, Devonshire breed, was sent in by Mr. A. Rose; but in consequence of no other competitor offering, a Prize for this fine animal could not be awarded.

For the Prize for the second best specially imported Bull of 1843, there was no competition.

The Prize for the best imported Cow of any denomination was adjudged to a Roan Cow imported in December 1843, per *Vernon.* But this animal not having been entered as the property of Government, although specially imported as a gift for the Rajah of Nepaul, and no claim being made on behalf of Government, the silver Medal was awarded to Mr. Caleb Ladd, for his English Pole Cow, imported per Ship *Mary Bonnington.*

Produce.

The gold Medal was given to Mr. C. J. Richards for his country bred Cow "Lena."

For the best Bull Calf of any denomination calved in 1843, the gold Medal was given to Mr. A. Rose, for his red and white Bull Calf, dropped by the Cow alluded to above. This award was made with the proviso, that the Calf was the property of Mr. Rose, and should it be ascertained that this animal is also the property of Government, the Medal to be given to Mr. J. Wallace for his Red Bull Calf, partly Devonshire, and imported in December 1843, now six months old.

For the best Cow Calf of any denomination, calved in 1843, the silver Medal was awarded to Mr. J. Wallace, for his Black Devonshire Cow Calf, dropped in January 1843.

For the best cross, the produce of different varieties of Cattle, indigenous to this country, there was no competition.

Imported Sheep.

For the 1st, 2d and 3d Prizes, we had not any competition.

Produce.

The gold Medal was awarded to Mr. Wm. Storm, for his three-quarter-bred Ewes, as the best wooled cross presented.

The silver Medal was given to Mr. John Muller, for the second best description of the same cross. For the 6th, 7th and 8th Prizes there was not any competition.

Since the foregoing report was drawn up, your Committee have been informed by Mr. Rose, that the Red and White Bull Calf referred to under the head of Produce, is his "own individual property," your Committee have accordingly awarded him the gold Medal for the animal.

Signed C. R. Prinsep,
,, C. Huffnagle,
,, James Hume.

The Report was duly confirmed.

Horticultural Exhibition.

A Report from the Fruit and Kitchen Garden Committee, regarding the show of fruits and vegetables held on the 31st of January was next read. The Committee enter into some details respecting the various descriptions of vegetables, &c. that were exhibited, and close their Report by annexing a list of Prizes awarded to the successful candidates, amounting to one hundred and thirty-two Rupees and two silver Medals. The Report of the Committee was confirmed.

Prize of three hundred Rupees and a gold Medal for a good Vernacular Hand-Book of Agriculture, Horticulture and Farming.

The Minutes of the Committee of Papers, to whom was referred the communication of Mr. H. C. Tucker on the proposed transfer of his Prize of three hundred Rupees and a gold Medal offered in 1841, for encouraging tree plantation in the Upper Provinces, to whichever of the three desiderata named in his letter, the Society might deem most likely to lead to practical good, were next submitted. Dr. Griffith considers that the second proposal of Mr. Tucker, (the best practical paper on the *Oosur plains* of the North Western Provinces,) is so comprehensive, and would require such personal investigation, that it is not likely to be carried through. The third, (the erection and working of a full-sized Windmill,) Dr. Griffith thinks, may be left to private enterprize. But the first, (a good *Vernacular* Hand-book of Agriculture, Horticulture and Farming, suited to Natives of India, in the Hindostannee, Persian character, as the vernacular and character most widely used by respectable natives,) Dr. Griffith is of opinion, would be invaluable, while its preparation would also be comparatively easy; and he thinks that the Society could not in any way add more soundly to its reputation than by aiding in the preparation of the same by some addition to Mr. Tucker's Medal and Donation, and by the exercise of its judgment on the book when completed.

Dr. Mouat perfectly coincides in Mr. Griffith's views, and thinks that such a work, carefully compiled and translated, would be nearly as useful for education, as it would be for Agricultural purposes. He is also of opinion that Rupees 1,000 would be well bestowed to accomplish so desirable an object. It should not be merely a transcript of any European Hand-Book, but in a great measure original, and specially adapted to this country. The second project proposed, Dr. Mouat regards as quite impracticable, there being (to the best of his belief,) no one in this country, with sufficient leisure to devote to such an undertaking, who possesses the requisite qualifications.

Mr. Hume is of opinion, that the first of the three propositions is the best, certainly the most practical and immediately useful to the multitude; but he is not prepared to recommend the Society to come under a promise to add Rs. 1,000, or even Rs. 700 to Mr. Tucker's premium. Mr. Hume thinks, however, the sum offered by Mr. T. might be given for the work, the Society taking upon itself the expences of publication, and bringing it out at the earliest moment their funds will allow, giving to the Author the entire proceeds of the Vernacular Edition, and re-

serving the profits of the English edition to itself, if it should have one prepared.

On these minutes being read, some discussion ensued; when Dr. Griffith having intimated that, on a reconsideration of the subject, he was in favor of the views taken by Mr. Hume; it was resolved to adopt them accordingly. The Secretary was requested to intimate the same for Mr. Tucker's information, and to make such arrangements as he might deem necessary, with a view to give publicity to the offer

Cultivation of Flax at Monghyr.

A communication from Mr. J. Wallace respecting the sample of Flax alluded to among the presentations, was next read. Mr. Wallace states, that these samples are a portion of several tons which have been grown at Monghyr by his brother, and that the only improvement observable is in their cleanness and their being a slight degree softer than the produce of former years from the same cultivation. Mr. Wallace intimates, that he intends shipping this flax to Dundee, the port to which his last batch was sent, and will herefater acquaint the Society with the result of the sales.

Mr. Wallace adds with regret, that after several years' labor with a view to establish flax cultivation at Monghyr, and after having taught the art of dressing the article to many parties, his brother will be compelled to abandon the speculation, unless the Government give some encouragement; he therefore requests the assistance of the Society in bringing the subject to the notice of the Authorities.

In connection with the above letter, the Secretary drew the attention of the meeting to a report of the Flax Committee, with its appendices, on the nature and prospects of Flax cultivation in India, which was presented at the meeting of the Society in November 1841, together with the letter of Mr. Secy. Maddock, wherein it is stated, that "His Lordship in Council is much inclined to doubt whether any bounty or reward from Government is necessary, or would be justifiable for the support of this undertaking, since the cultivation of Flax can no longer be considered a doubtful experiment," and suggested with reference thereto, that Mr. Wallace be requested to furnish further details regarding his cultivation.

The meeting agreed to this suggestion, and further directed, that the samples be referred for report to the Flax Committee, preparatory to the Society taking into consideration the request contained in Mr. Wallace's communication.

Manufacture of Cloth from the thread of the Pine-Apple and Moorva, (Senseviera Zeylanica.)

An interesting communication from Miss Davy, in reference to the samples of cloths manufactured from the fibre of the Pine-Apple and Moorva or Moorghie, (Senseviera Zeylanica) already noticed among the presentations, was next submitted. Miss Davy mentions, that having been solicited by the late Dr. Spry to endeavour to manufacture cloth from the pine-apple thread, she has, after much difficulty and many obstacles to her efforts, at last succeeded. Miss Davy states, that the principal manufacturers in Dacca positively refused to undertake making it into cloth; at length a weaver, in the jungles, near Dacca, undertook it, and the piece of cloth now submitted is the result of his experiment which, Miss Davy thinks, with a little more experience, and proper directions being given as to the mode of dressing the cloth when taken out of the loom, might be made equal to that of Manilla. In reference to the cloth of the Senseviera Zeylanica, Miss Davy observes as follows:—

"During my residence in the Mofussil, I met with a plant which is known to the Natives by the name of the Moorghie; the only use they make of the thread, is to twist it into a very fine kind of bobbin, to suspend ornaments round the neck, and the Braminical thread is sometimes made of this fibre. I now send a specimen of some cloth I have made from this leaf; it is by no means what I could wish. I prepared the thread in the same manner the Natives usually do; it is too wiry and stiff, and they have spun and wove the coarse and fine fibres indiscriminately together, which gives it a very uneven and irregular appearance; but if the coarse fibres are carefully separated from the fine, and the thread made more pliant and soft, no doubt a very beautiful cloth may be manufactured from it, as with the aid of a mangle and a press, it will take as fine a gloss as silk. It takes most brilliant colours. I send a specimen of two different colours, and one of the pine-apple, which however is not equal to the Moorghie thread."

The examination of these cloths and of the thread in a dyed state, excited much interest. On the proposition of Dr. Huffnagle, seconded by Mr. Storm, it was resolved, that the best acknowledgments of the Society be tendered to Miss Davy for her interesting communication and samples, and that she be requested to accept the sum of one hundred rupees to cover the expense of manufacturing these fabrics.

The Secretary brought to the notice of the Society, in connection with the present subject, that so long since as at a meeting in June

1839, the Society was favored by Miss Davy with "specimens of a thread prepared from the wild pine-apple plant of Assam," and the attention of the Members was on that occasion drawn, "to the value which the beautiful texture of the thread was likely to prove in the manufacture of the finest fabrics." The samples in question were transmitted to the then existing Committee of Agriculture and Commerce of the Royal Asiatic Society, with a request, that they might be submitted to the inspection of manufacturers and the intrinsic value of thread obtained, but up to the present time, no report had been received on the subject. In reference to the Sensevicra Zeylanica, which has long been known for the strength of its fibre, he begged to place on the table samples of fibre and rope made therefrom, which were presented to the Society by Mr. Greenlaw, also, at the meeting of January 1839. In his communication, Mr. Greenlaw stated, that experiments were then being made to ascertain whether it could be "worked up into rope, and if so into what kinds and sizes, and to see whether it could not be used instead of hemp in the packing of Steam Engines." It was further observed in the same communication, that the Marine Board intended getting up "a good quantity of it to try it on a large scale for ropes, if on trial on a small scale it is found equal in strength to coir or hemp."

The Secretary was requested to place himself in communication with the Superintendent of Marine, in order to obtain further information in the matter alluded to by Mr. Greenlaw. It was likewise determined that a portion of the samples presented by Miss Davy be transmitted to the Society of Arts and Royal Asiatic Society, and that the attention of the latter Society be brought to the samples formerly transmitted.

Oil from the Nut of the Terminalia catappa, or Country Almond.

A letter was read from Mr. A. T. Smith, at Jessore, regarding the sample of oil expressed from the nut of the Country Almond, (Terminalia catappa,) already referred to under the head of presentations, also a report thereon by Dr. Mouat.—(See Journal, vol. 2, part 2, page 539.)

Importation of Wheat Seed from Australia.

The Secretary begged to submit a communication from Baboo Mutteeloll Seal, suggesting the importation of Wheat seed by the Society from the Cape and New South Wales. The Baboo offers his services in placing any quantity of seed that might be entrusted to him in the hands of his agents in the various Wheat districts of Behar and

Upper India, with directions to have it properly sown and attended to, and to communicate the result to the Society. (This communication will be found in vol. 2, part 2, page 545 of the Journal.)

With reference to this communication, the Secretary drew the attention of the meeting to the measures which were taken in 1839 by the Society, to obtain a quantity of seed corn from abroad. From a memorandum he held in his hand, it would appear, that in August 1840, a consignment of seed, consisting of upwards of 130 bushels, was received by the Society, and distributed to more than one hundred persons resident in Bengal, Behar, the N. W. Provinces and Central India. The Society also offered on that occasion to be the medium of obtaining corn seed, *on a large scale*, for all persons desirous of procuring seed for trial on their lands; but, with a single exception, this offer met with no response or encouragement.

The meeting having taken into consideration the suggestion of Baboo Muttecloll Seal, and the remarks of Mr. Wood, it was agreed, that the sum of £20 be placed at the disposal of the Secretary, in order *to* obtain a supply of seed corn from Launceston and Sydney.

Bhauglepore Branch Agri-Horticultural Society.

The papers next read to the meeting were two communications from Major Napleton, Secretary of the Branch Society at Bhauglepore. Major Napleton advises the despatch of a plan of their public garden to be presented to the Hon'ble the President, Vice-Presidents and Members of the Parent Society, with an expression of their hope, that their endeavours to lay out 14 beegahs of ground usefully and ornamentally have not altogether failed, and a request, that the Society will forward the plan for the inspection of the Hon'ble the Vice-President in Council, with a request, that he will allow 50 copies of the plan to be struck off at the Government Lithographic Press, for presentation to those of the Subscribers who have not yet seen the garden.

In a second communication, after returning thanks for the very handsome present of the English Fruit Trees, and conveying their assurance, that every possible means shall be employed to bring them to maturity, Major Napleton adds:—

"The wishes of the Fruit and Kitchen Garden Committee touching an interchange of seeds between this Institution and the Parent Society, shall meet with every possible attention. I have a very large garden of my own in full cultivation, from which I shall collect seeds as well as from the public garden, and I am quite sure this arrangement will meet the entire concurrence of every Member of this our

Branch Society. I shall now bring to notice the very great assistance and support we continue to receive from Dr. Griffith, Superintendent Hon'ble Company's Botanical Gardens. He is a real friend to Agriculture and Horticulture, and so readily and cheerfully contributes whatever is in his power to give, and what he considers will prove useful to us with reference to the climate and temperature of Bhaugulpore, that we should be ungrateful indeed were we not thus publicly to acknowledge his kind services."

The best thanks of the Society were given to Major Napleton for his communication, and the Secretary was requested to intimate the gratification afforded to the Parent Institution by the success which has attended the efforts of this useful Branch Society. It was further directed, that the request conveyed in regard to the plan of the garden should be attended to.

Application to the Court of Directors for transmission of Agricultural Seeds.

The Secretary stated, that it would be very apparent to Members, not only from the above communications of Baboo Mutteeloll Seal and Major Napleton, but from several others which had been read at late meetings of the Society, how great a desire was felt by many Members to improve the agricultural resources of the country by a distribution and interchange of useful seeds. However well inclined, the Society might be to assist in promoting the views of such public-spirited individuals—and the constant distribution that was being carried on was a proof of this desire,—it could not be expected that the funds of the institution were sufficient to meet all demands, or to carry out the objects contemplated to any great extent. He begged in connection with this subject, to call the attention of Members to the handsome offer of the Honorable Court of Directors, as contained in the following extract of their letter, No. 25 of 1842, in the Public Department, dated the 21st December, (in reply to the Society's application of the 13th September 1841,) which was submitted with Mr. Deputy Secretary Bayley's letter of the 1st March 1843, at the general meeting of the Society in April last :—

"We shall, however, be disposed to meet the wishes of the Society to a certain extent, when the direct communication between Suez and Calcutta, by Steam, is effected, and shall take opportunities of sending occasional supplies of such seeds as are deemed of importance, by the most speedy conveyance;" and with reference thereto, to enquire whether the present might not be deemed a fitting time to address the local Government again on the subject, with a respectful request that they would transmit such application to the Honorable Court.

The meeting perfectly coincided in the above suggestion, and the Secretary was directed to address the Government accordingly.

Progress of the Public Garden at Lucknow, and proposed Distribution of Seed, the produce of the Garden.

An interesting communication from Capt. G. E. Hollings, in charge of the Public Garden at Lucknow, was next read. Capt. Hollings enters into detail regarding the various cultures in the garden. Hitherto the season has been particularly favorable, there is promise of abundance of Fruit from the Loquat trees, and it seems from the number and strength of the blossoms, that there will be a good Mangoe season. Capt. Hollings mentions, that there is a very fine crop of Tobacco from seed sent by the Parent Society. The Arrow Root cultivation promises very well, as well as the Cotton from acclimated seed. In regard to Vegetables, the garden can boast of many excellent specimens raised from seed supplied by the Parent Society, also various beautiful descriptions of Flowers from seed commissioned by Captain Hollings from England. The Strawberry Plants and Apple Trees are not so forward, Captain Hollings adds, as the Cantonment ones, but they are very healthy, and he expects next year to be able to spare some thousands of the former to friends at Cawnpore, Seetapore, and at other neighbouring stations.

Captain Hollings concludes his letter with the following liberal and considerate offer :—

" In furtherance of the objects the accomplishment of which is contemplated by the Society, I shall be happy to give any of the Members who may require them acclimatised seeds of every fruit, flower and vegetable which I may succeed in rearing; and if you think proper, you may advertise that any application made to me will be attended to —the seeds will be furnished *gratis*, but the parties receiving them will have to pay the expences of transit."

The Secretary intimated that he had requested the favor of Captain Hollings sending an assortment of seeds for distribution to Members of the Society in the Lower Provinces, and would take opportunities of notifying this offer to parties in Upper India, to admit of their availing themselves of it also.

The best thanks of the Society were tendered to Captain Hollings for his kind and liberal offer, and for the interest which he takes in promoting the cause of Horticulture.

Munjeet, or Indian Madder.

The Secretary mentioned that he had been favored by a Member of the Society with a communication regarding the article Munjeet, or Indian Madder, of which he begged to read the following extract :—

"Have you on the Records of the Society any account of the cultivation of the article of Munjeet, or Indian Madder, in the district where it is principally, I believe, grown in this country; viz., Purneah? It is cultivated also in Nepaul, and perhaps in other places besides Purneah, of our own territories. It is an article which, I think, is deserving of greater attention than has been paid to it, and it is worth the while of the Society to institute some enquiry into its mode of culture, &c., and endeavour thereby to improve the quality, if possible, of the kind usually sent to the Calcutta market, or, if this be impracticable, to import some of the French or Dutch Madder seed. The Madder seed should be imported from Marseilles viâ Egypt, to ensure its being landed here fresh and good."

In reference to the above query, the Secretary drew the attention of the meeting to an article from the pen of Mr. Hodgkinson, which is published in the second volume of the Transactions of the Society, giving some directions for the cultivation of European Madder, (Rubia tinctorum,) and presenting a supply of the seeds to the Society. He also begged to mention, that he had just been favored by Mr. Cathcart at Purneah, whom he had addressed on the subject, with the following particulars :—

"Your correspondent has been led into error in supposing that Munjeet or Indian Madder is cultivated or produced here. Munjeet is solely produced in Nepaul, and the higher ranges of hills bordering upon the Morung, whence it is brought by the natives of the hills for sale in this district. It is bought here by the native Mahajuns, and sent to Calcutta; this may have given rise to the idea that it was a natural production of this district. The Munjeet is said to be the Rubia cordifolia, quite distinct from Rubia tinctorum, and is reckoned much inferior as a dye.

"When at Darjeeling I observed either the Munjeet, or a nearly allied species, growing abundantly wild in the neighbouring forests, from which circumstance I should suppose, that it was partly gathered in the wild state, and this latter circumstance may account for its inferiority. Perhaps Dr. Campbell at Darjeeling, or the Resident at Nepaul, could give more correct information on this subject."

Dr. Griffith informed the meeting, that his attention had been lately directed to this article from the marked desire expressed by a Batavian gentleman of procuring live plants; and he immediately wrote to Dr. Campbell, at Darjeeling, Mr. Vansittart at Musoorie, and Major Jenkins, mentioning this to them, and recommending the plant to their notice, that in case any increased demand arose for it, India might

not be behind hand in supplying it. Dr. Griffith stated, that he had already received samples from Dr. Campbell, which he would submit at the next meeting, with any other musters that might be sent to him, and when sufficient comparison had been made, he would draw up a short account of the plant for the Society. Dr. Griffith added, that in making comparison between it (Munjeet) and the European Madder, it is to be remembered that the former is a very distinct species from the latter; the Madder being the root of the Rubia tinctorum, the Munjeet of the Rubia munjisthar of Roxburgh, R. cordifolia of Botanists, according to Dr. Royle.

The meeting was of opinion, that it would be advisable to wait the result of the present enquiries before taking further steps in this matter. The Secretary was requested to tender the thanks of the Society to its correspondent for his suggestion.

Communication on various subjects.

A letter was read from W. E. Underwood, Esq., Collector of Sea Customs at Madras, intimating, that the forty barrels of Cotton seed despatched in October last to the Society by the Madras Government, is *not* the produce of the Coimbatore Cotton Farm, but was received from Liverpool in December, 1842.

Letters were also read from the Society of Arts, Royal Horticultural Society of Cornwall, the East India and China Association, and from the Chamber of Commerce at Manchester, tendering their acknowledgments for the first volume of the Society's Journal.

For all the foregoing presents and communications, the best thanks of the Society were accorded.

(Wednesday, the 13th of March, 1844.)

The Hon'ble Sir J. P. Grant, President, in the chair.

Messrs. R. V. Thurburn, and G. E. Edmonstone, who were proposed at the last meeting, were duly elected Members of the Society.

Presentations to the Library.

1. Report of the Sudder Dewanny Adawlut, N. W. Provinces, on the administration of Civil Justice, for the year 1842.—*Presented by the Government of the N. W. Provinces.*

2. The Moulmain Almanac and Directory, for 1844.—*Presented by G. E. Barr, Esq.*

The India Journal of Medical and Physical Science, No. II. of vol. II. —*Presented by the Proprietor.*

Museum and Garden.

1. Samples of Cotton grown from foreign seed in the Deyrah-Dhoon, and eighteen samples of Wheat and Barley, all the produce of acclimated seed, grown in his experimental Farm at Delhi.—*Presented by G. H. Smith, Esq.*

The Secretary submitted a report in detail on the grain samples with which he had been favored by Mr. William Haworth. The report was handed to the Committee of Papers, and the other samples were referred to the Cotton Committee.

2. A few seeds of the Phormium tenax, or New Zealand Hemp, gathered in the district of Nelson, in May, 1843.—*Presented by James A. Wood, Esq.*

3. Sample of Coffee, the produce of his garden at Monghyr.—*Presented by W. C. Breen, Esq.*

Mr. Breen observes, that the article has been a good deal broken, from the native gardener who prepared it not sufficiently understanding the operation, still he considers it good upon the whole, and of excellent flavor.

Two reports on this sample were submitted from Messrs. Speede and Owen. Both reports speak well of the flavor of the article, but add, that the berries appear to have been taken from the tree in rather too ripe a state, which may account for their broken appearance, and deficiency of colour.

4. A small supply of Sreenuggur Onion Seed.—*Presented by Captain H. Huddlestone.*

Captain Huddlestone promises to send a further quantity of this superior description of seed on his return from Almora to Gurhwall, and an additional supply in August or September next.

5. A few Locusts of the legion which caused so much havoc last year to the indigo and wheat crops in the Upper Provinces, caught at Nudjuffghur, near Cawnpore.—*Presented by J. W. Roberts, Esq.*

6. A small bouquet, containing some fine specimens of Snapdragon, variegated Larkspur, Dahlias, &c., with a few Hyacinths from the bulbs lately imported by the Society.—*Presented by Geo. Wood, Esq.*

Indian Wheat Question.—Petition to Parliament.

The proceedings of the Wheat Committee in reference to a petition to the two Houses of Parliament, was the subject that first came under consideration. The Committee state, that in pursuance of the resolution passed at the late special meeting, they have duly prepared, and beg to submit a form of petition for the approval of the Society. [This Petition will be found at page 317, Vol. II.]

It was moved by Mr. Speede, seconded by Mr. Staunton, and *Resolved*—That the petition now read be adopted, and that it be forthwith duly engrossed on parchment, in duplicate, signed by the President, and afterwards circulated for the signature of resident Members.

Resolved.—That the Earl of Auckland be requested to present the Petition to the House of Lords, and Joseph Hume, Esq. to the House of Commons.

Manufacture of Cloth from the fibres of the Pine-apple and Senseviera Zeylanica, (Moorva, or Moorghie.)

In continuation of the interesting letter from Miss Davy which was read at the last meeting, the Secretary stated, he had the pleasure to submit another communication on the same subject, with which he had been favored by that lady. After returning her thanks for the resolution which was come to at the last meeting, Miss Davy states that, in compliance with the request of the Society, she begs to send two handkerchiefs of the pine-apple thread, one embroidered and one plain; also one of the Moorghie thread, with a pair of cuffs of the same worked in silver for the sleeves of a lady's dress. Miss Davy then goes on to observe as follows :—

" As I could not get the natives of this country to work the point lace stitches equal to the Nuns in the convents in Manilla, I have had them embroidered in silver, a style of work, in which the natives of India excel. It will work as well as thread. I have sent some thread of each kind, that the manufacturers in England may try if they can get it spun by machinery, but there is not sufficient to make cloth. The pine-apple thread is not very fine, being the coarser fibres which have been separated from the fine and set aside for the embroidery. There is no doubt but that the Moorghie thread, when prepared with as much care as I have taken with the pine-apple, will be more generally useful. If the Chamber of Commerce should think it of sufficient public importance, and will place a small sum of money at my disposal, (as I have no funds of my own), I will prepare a sufficient quantity of thread for the experiment to be made in England to manufacture into cloth. The chief expence will be the spinning, which I think must, for some time at least, be done in this country. The thread must be prepared when the leaves are green, as nothing can be done with them in a dry state."

The Secretary was requested to send these cloths and fibres to the Society of Arts and Royal Asiatic Society. It was also directed that a copy of Miss Davy's communication be handed to the Chamber of Commerce.

Bauglepore Branch Agri-Horticultural Society.

A letter from Major Napleton, Secretary of the Branch Society at Bauglepore, was next read. Major Napleton states he has great pleasure in reporting that the two glazed cases of English Fruit trees, which were transmitted by the Parent Society, have reached their destination *in excellent order;* all the trees are alive and thriving. Major Napleton encloses an account of the third show of the season, which took place in the public garden of the Branch Society, on the evening of the 3d of February.

The thanks of the Society were given to Major Napleton for sending this account, which was referred to the Committee of Papers.

Communications on various subjects.

From John Owen, Esq., presenting memoranda on the manufacture, &c. of Black Tea, as adopted by the Muttock Tea Company in Assam, and on the method of collecting Opium, as practised in the same country.

From Mr. J. A. Wood, some particulars respecting the New Zealand Hemp, alluded to among the presentations.

These communications were referred to the Committee of Papers.

From Mr. J. Wallace, giving, in pursuance of the request of the Society, a detailed account of the operations pursued at his Flax cultivation at Monghyr during the past season. (Referred to the Flax Committee.)

In consequence of the lateness of the hour, a few communications were unavoidably delayed till the next meeting. For all those that were presented, the best thanks of the Society were accorded.

(Friday, the 12th of April, 1844.)

William Griffith, Esq. Vice-President, in the chair.

The names of the following gentlemen were submitted as candidates for election :—

Alexander Grey, Esq., M. D. Seetapore,—proposed by Mr. John Allan, seconded by Mr. Wm. Storm.

Capt. Henry J. Guise (28th N. I.) Commanding Ramghur Irregular Cavalry Dorunda,—proposed by the Secretary, seconded by Dr. Griffith.

T. B. Gubbins, Esq, Civil Service,—proposed by Mr. Allan, seconded by Mr. Storm.

Lieut. Col. J. R. Ouseley, Agent Governor General S. W. Frontier,—proposed by Dr. Griffith, seconded by the Secretary.

Edward Pryce Griffiths, Esq. Merchant, Calcutta,—proposed by Mr. Alexander Sawers, seconded by the Secretary.

Presentations to Library.

1. Journal of the Asiatic Society of Bengal, No. 59.—*Presented by the Society.*

2. Report of the Bombay Chamber of Commerce, for the second quarter of 1843-44.—*Presented by the Chamber.*

3. The Indian Review and Journal of Foreign Science and the Arts, No. 7 of Vol. I.—*Presented by the Proprietor.*

4. The India Journal of Medical and Physical Science, No. 3, of Vol. III.—*Presented by the Proprietor.*

Garden and Museum.

1. A couple of China Orange trees, and a few Straits' Pine-apple roots. —*Presented by P. Peord, Esq.*

2. A small box of English fruit trees, received per *Windsor.*—*Presented by Major Jenkins.*

The Secretary mentioned that seven only of the thirteen trees contained in this case had reached alive; and these were unfortunately in so poor a condition, that he was obliged to distribute them forthwith to resident members.

3. A bag of Guano from Penang.—*Presented by W. T. Lewis, Esq.*

Mr. Mackey, who presents this manure on behalf of Mr. Lewis, states that that gentleman has transmitted it with the view of ascertaining the sentiments of the Society on its application in this country, and whether, if any quantity was sent round, the Society would be disposed to take it on its value, or rather cost of collection, shipping, freight, &c.

It was agreed that the supply should be sent to the Society's Garden for trial; Dr. Griffith having kindly consented to direct its special application. It was also agreed to await the result of such experiment before taking steps to procure a further supply. The best acknowledgments of the Society were voted to Mr. Lewis for this presentation.

4. Samples of Darjeeling Munjeet in an unripe and in a prepared state.—*Presented by Dr. Griffith, on the part of Dr. Campbell.*

5. Sample of saccharine material obtained from the juice of Maize stalk, and of spirit distilled from the same substance.—*Presented by C. B. Taylor, Esq.*

6. Sample of Carolina Paddy, of the third year's growth in India. —*Presented by F. Bellairs, Esq.*

An apricot grown in his garden at Howrah.—*Presented by P. Homfray, Esq.*

This is considered a very good specimen in point of size, being about 4½ inches in circumference. An apricot which was presented by Mr. R. S. Homfray, at the April Meeting of 1840, the produce of his garden at Barrackpore, was placed on the table for comparison. The latter is only 3 inches in circumference.

Indian Wheat Question—Petition to Parliament.

The Secretary informed the Members that, in accordance with the resolution of the March meeting, he had transmitted the Petitions to Parliament, by the last mail, to the care of the Earl of Auckland and Joseph Hume, Esq. During the brief time allowed for their circulation, the Petitions had received the signatures of upwards of one hundred of the resident Members of the Society. The following is copy of the letter addressed to the Earl of Auckland:—

To the Right Honorable the Earl of Auckland, *G. C. B.*

My Lord,—I have been directed by the Members of the Agricultural and Horticultural Society of India to request the favor of your Lordship's presenting the accompanying Petition, relative to the introduction of Indian Wheat into British Ports on an equalized duty with the production of Canada, on their behalf to the House of Lords.

They feel assured that the prayer of it will receive your approval and support. The interests of India alone are not concerned in the question; but are identified with those of the Agricultural, Manufacturing, and other classes of Great Britain.

The Petition, and Report which accompanies it, enter so fully into detail, that I conceive it unnecessary to occupy your Lordship's time with a lengthy communication: allow me however to add, that the Members of the Agricultural and Horticultural Society are convinced, that their Petition could not be entrusted to any one more able to appreciate the benefits resulting from the boon now sought, or more willing to urge them, than your Lordship, who, as Patron of the Society for a period of six years, conferred so many benefits on the Institution, and thereby assisted to promote the development of the great agricultural resources of this vast portion of the British Empire.

I have, &c.

(Signed) James Hume,

Calcutta, March 20, 1844. *Hony. Secy.*

Horticultural Exhibition in May.

A schedule of Prizes to the amount of two silver Medals and one hundred Rupees, to be awarded at the next show, for the best samples of fruits and vegetables, foreign and indigenous, was submitted on the

part of the Fruit and Kitchen Garden Committee. It was suggested that the exhibition be held on Tuesday, the 7th proximo, at 6 A. M.

The Meeting agreed to the schedule, and the day proposed for the exhibition. The Members of the Committee were requested to act as Judges.

Carey Testimonial.

The Secretary stated he had been favoured by the last mail with a letter from Dr. Royle, relative to the Bust of Dr. Carey, of which the following is an extract:—

India House, 31st January, 1844.—"I have to acknowledge your letter of the 13th November 1843, enclosing an order, 8 months after date, for £120 on Sir Claude Scott, Bart and Co. The wishes of the Society respecting the Bust of Dr. Carey, whom I, as well as all the old Members, venerate for the zeal and discretion with which he originally suggested and founded the Society, and for the interest he continued to take in the Proceedings of the Society until the period of his death, shall have my best attention. As soon as the Clay Bust arrives, I will take all the necessary measures, visit the Baptist Society's Rooms, and communicate with Dr. Carey's son, so that the artist shall have every facility in making as good a likeness as is practicable with the materials available. I will also call the attention of some Members of the Society of Arts, to the fact of the clay bust having been made by a native of India; I know not what are their regulations for awarding Prizes.

The best thanks of the Society were directed to be tendered to Dr. Royle for his obliging compliance with its wishes.

Society's Journal.

Some minutes from the Committee of Papers, suggesting that a change be made in the present mode of publishing the Society's Journal were brought to the notice of the meeting. The Members are of opinion, that it would be more desirable to issue the numbers according to circumstances, instead of engaging to bring them out monthly. It was agreed that the question be brought forward for discussion at the next meeting.

Munjeet, or Indian Madder.

The Secretary intimated that since the February meeting, he had received from Dr. Griffith two samples of Munjeet, which had been forwarded to him by Dr. Campbell, the Superintendent of Darjeeling. The first, or unripe sample, came to hand too late to admit of its presentation at that meeting, when the subject was under consideration;

the second, or sample in a prepared state, was received only a few days before the present meeting. He had, intermediately, been favored with an interesting letter, in reference to both these samples, from Dr. Campbell, which if the meeting pleased, could be referred to the Committee of Papers. Referred accordingly.

Experiments for the Manufacture of Sugar from Maize Stalks.

The Secretary intimated, that he had received a communication from Mr. C. B. Taylor, at Palamow, affording a detailed account of his attempts to manufacture Sugar from the stalks of Maize or Indian corn, samples of which were on the table. He had also had some correspondence with Mr. Frederick Nicol, of Jessore, on the same subject. The attention of both these gentlemen was attracted to the subject from reading an account of some successful experiments which had been made in the United States. Both, it appears have as yet failed in their attempts from various causes, but they state their intention of persevering in their endeavours to procure a good article. With a view to assist in carrying out their intentions, the Secretary stated he had furnished them with a large supply of the superior description of Maize which has been lately received from America, and had requested to be favored with further particulars of the result in due course for the information of the Society. The Secretary added, that he had submitted Mr. Taylor's sample to Mr. Cowell, who had obligingly given him an opinion on it, to the effect that the article has " evidently been burnt in its preparation, and possesses in consequence no granulation, and an acid empyreumatic taste, and that, in its present state, it is not likely to answer any purpose either for the grocer or refiner."

The Correspondence was transferred to the Committee of Papers, with a view to its publication in the Journal.

Carolina Paddy.

A Report from Mr. Haworth on the sample of Paddy, the produce of Carolina stock, alluded to among the presentations, was next submitted. Mr. Haworth observes, that as he has no idea of the quality of the first year's seed from which the sample has been produced, he can only judge as it now compares with grain in his possession. Mr. Haworth states, that if the original seed was equal in quality to the general run of Carolina Paddy, the third years' produce has degenerated very much, being a poor small grain, not equal to many of the Bengal kinds in quality, color, and size of grain.

In connection with the above, the Secretary stated he had lately received a communication from the Secretary to the Government of India in the Home Department, submitting an application from the Colonial Assistant Secretary at Ceylon, for a supply of Carolina Paddy, for cultivation in the Northern Province of the Island; he had also applications of a similar nature from Major Jenkins, in Assam, Mr. Chapman, at Chuppra, Baboo Sumboochunder Ghose, at Beerbhoom, and from other Members. In consequence of these calls, he had again placed himself in communication with Messrs. Haworth and Hardman, to learn if they had received any accounts of the seed which they had last year obligingly undertaken to endeavour to obtain for the Society, and from the following extract of a letter of the 4th December, from their Liverpool correspondents, it would appear that hopes may be entertained of the receipt, shortly, of the desired supply.

" *Carolina Paddy*, for the Agricultural Society. As we have found that it would not be practicable to send our orders to America for seed Paddy to be here in time, to arrive in Calcutta so early as the Society require it, we have determined not to order any from thence, but to take our chance of selecting some good seed from any parcels which may arrive; we think it very probable that we may obtain the quantity required, as the Carolina Paddy is said to be both early and good."

Messrs. Haworth and Co. add, that should the next mail bring them any information on the subject, they will not fail to communicate it.

Dissolution of the Hooghly Branch Society. Formation of a Branch Garden at Benares.

A letter was read from Dr. Esdaile, announcing the dissolution of the Hooghly Branch Society from want of support on the part of the Landholders in the District. Dr. Esdaile observes, that although the Society has failed in establishing a permanent Nursery Garden for the district, considerable good has been done by the distribution of seeds to the Native gardeners, and prizes for the best vegetables. By this means, the Kitchen vegetables have been much improved and spread over the country.

A communication was likewise submitted from the Rev. James Sharpe, intimating the formation of a Public Garden at Benares, and requesting the assistance of the Society in whatever way it can be extended. It was agreed that every assistance consistent with the means of the Society should be afforded.

Tea Seed from Assam.

The Secretary informed the meeting, that he had been lately favored with a letter from Major Jenkins, the Commissioner of Assam, of which

he had the pleasure to read the following extract, for the information of those who may be desirous of availing themselves of so good an opportunity of procuring Tea seed:—

"Should you know of any gentleman who may want Tea seeds from Assam, if you will kindly let me know in time for the next season, I shall be happy to do my best to procure any quantities that may be required. I find this season, in one place or another, fully 80 maunds of Tea seed has been collected, and a good deal has been selling for 80 or 100 Rs. a maund. The Assam Company have abandoned some of their *Barries*, and apparently are not going to extend their remaining plantations, so that next season 100 maunds of Tea seed might be readily commanded, and I should imagine the cost would not be above the lesser sum.

Successful Cultivation of Potatoes at Darjeeling.

A communication from Lieut. Col. Lloyd, dated from Darjeeling, respecting the abundant produce obtained from his Potatoe cultivation at that station, was next submitted. After alluding to the circumstance of that place being capable of producing very good potatoes, and that they are available at a season (July, August, &c.) at which those produced in the plains are not eatable, Col. Lloyd observes, that it may perhaps be interesting to the Society to learn the rate of increase at which this useful article may, by care, be produced there. In the year 1841, Col. Lloyd mentions a very large Potatoe was dug up in his garden; it weighed at first upwards of seven chittacks, and after it had become dry, fully six. There being a great number of eyes in this Potatoe, it was in the month of March 1842, cut into upwards of a dozen pieces, and planted in good ground, and its produce was 17 seers. These 17 seers were planted in whole Potatoes in the early part of 1843, and have produced 9½ maunds of very good Potatoes. The Bangalore Potatoes, Col. Lloyd states, was the kind from which the large one was derived. Col. Lloyd, adds, that "as his Potatoes have this year (1843) produced many apples, he has forwarded a few for distribution, in the hope that some useful varieties, and perhaps some better adapted to the climate of India, may be obtained by sowing the seed."

The Secretary mentioned the promised supply had not, up to the present time come to hand, and he feared it had been lost on the route.

Communications on various subjects.

1. From the Secretary to the Govt. of the N. W. Provinces, transmitting, by desire of the Hon'ble the Lieut. Governor, a report from Dr. Jameson, regarding the cultivation and manufacture of Tea in Kemaon.

2. From the Acting Superintendent of Marine, giving, in reply to Secretary's letter of enquiry, the result of trials made on rope manufactured from the fibres of the Moorgavie Plant.

3. From J. O. Price, Esq. Govt. Cotton Planter, communicating the result of sowings, in the district of Dacca, of Cotton seed furnished him by the Society at the request of Government.

These three communications were transferred to the Committee of Papers.

4. From H. C. Tucker, Esq. dated Mynpoorie, 21st March, intimating his gratification at the resolution of the Society, in reference to the prize formerly offered by him, to encourage tree planting in Upper India. Mr. Tucker observes, "I am pleased to hear that your Society has decided in favour of a Vernacular Hand-book of Agriculture, Horticulture, and Farming, with reference to India; and that it will liberally take upon itself the expenses of publication. I trust that a really good and useful work may be produced, combining with accurate scientific knowledge and an elegant idiomatic style, a thorough practical acquaintance with the soils, climate, productions, and Agricultural management of the country.

" A similar work is included in the list of vernacular class books, which the new Delhi Translation Society propose preparing for the use of the Government institutions."

5. From Messrs. J. Mackey and Co. intimating their readiness to forward the request of the Society for a supply of seed corn from Sydney and Launceston, to their agent at the former place.

6. From the Under-Secretary to Government of Bengal, stating that His Honor the Deputy Governor will be happy to direct the Officers of the Government Lithographic Press to strike off 50 copies of the plan of the Bhauglepore Public Garden, if the Society are willing to incur the expense, which it is understood, will be from Rs. 13 to Rs. 16 per copy, including drawing paper.

Resolved,—That a copy of the above letter be forwarded to Major Napleton, for the information of the Bhauglepore Branch Society.

For all the foregoing communications and presentations, the best thanks of the Society were accorded.

A letter was read from Dr. Royle, enclosing a bill from Mr. Groom, the florist, at Clapham, amounting to £54, for bulbs and tuberous roots forwarded to the Society. A report from Mr. Ross, Head Gardener, H. C. Botanic Garden, giving a very unfavorable account of these bulbs, was likewise submitted. It was agreed with reference thereto and to the large amount of the bill, that the Secretary be requested

to address Dr. Royle, with the view of some deduction being made by Mr. Groom.

Wednesday, the 8th of May, 1844.

William Griffith, Esq. Vice-President, in the chair.

The minutes of the last General Meeting were read and confirmed.

Members elected.

The gentlemen proposed at the last Meeting were duly elected Members of the Society ; viz.

Dr. Alexander Greig, Capt. Henry J. Guise, Lieut. Col. J. R. Ouseley, Messrs. F. B. Gubbins and E. P. Griffiths.

Candidates for election.

The names of the following gentlemen were submitted as candidates for election :—

Hugh Vans Hathorn, Esq. Civil Service, Chupra,—proposed by Mr. B. J. Colvin, seconded by the Secretary.

W. Rehling Esq. Indigo Planter, Rungpore,—proposed by Dr. Griffith, seconded by the Secretary.

Lieut. Col. Andrew Hervey, commanding 30th Regt. N. I. Lucknow, —proposed by Capt. James Wemyss, seconded by the Secretary.

Presentations to the Library.

1. Calcutta Journal of Natural History, No. 17.—*Presented by Dr. McClelland.*

2. The India Journal of Medical and Physical Science, No. 3 of vol. 2. —*Presented by the Editor.*

3. Reports upon the settlement of Zillah Etawah.—*Presented by the Govt. N. W. Provinces.*

Garden and Museum.

1. Two small boxes of vine cuttings, and a few arrow-root bulbs, from the Lucknow Garden.—*Presented by Captain G. E. Hollings.*

These cuttings have arrived in excellent sprouting condition, notwithstanding they have been more than two months in reaching their destination. One box has been transferred to the Society's Garden, the contents of the other are available to Members. The arrow-root bulbs are nearly equal in size to the generality of the produce of the Society's Garden, but much inferior to the select ones.

2. A further supply of Sreenuggur onion seed.—*Presented by Capt. Huddlestone.*

3. Minute samples of starch and old English red wheat, and of huskless and Lawsoneum barley.—*Presented by Melmoth Hall, Esq.*

In his letter forwarding the above grains, Mr. Hall mentions they have been grown at Goruckpore for three years following, and appear to him to be worthy of distribution. The starch wheat in particular was an object of great admiration to all who saw it. Mr. Hall adds, that he had no opportunity, from pressure of business, of taking notes of the quantity of seed sown or of any other particulars; but he hopes, this year, to give ample attention to the subject, and to communicate the result to the Society. It was agreed to transmit these seeds to Major Napleton for trial in the Bhauglepore Garden.

4. Samples of cotton, the produce of acclimated American seed grown in the Lucknow Garden; a small supply of the seed, and a specimen of thread spun from acclimated cotton.—*Presented by Captain G. E. Hollings.*

The Secretary mentioned he was indebted to a Member of the Society for an opinion on this cotton, and to Mr. Alexander Wallace, (firm of Henderson, Wallace and Co.), also a member, for a report on the thread. The cotton is described as "apparently from New Orleans imported seed, of very short fibre, and somewhat weak, and the color discolored from not being picked probably in due time or in wet weather." Mr. Wallace gives the following opinion on the thread:—

"I have examined the specimen of yarn spun from acclimated American cotton you sent me. My opinion is, that as a *specimen of yarn*, it is decidedly bad, whilst the cotton from which it has been spun would appear to be of a good quality. It is remarkable for its softness and the whiteness of its colour, and great care must have been taken in clearing it from seeds and dirt. Having been spun with the native hand-wheel, or probably with the fingers, the yarn is so very uneven, and so much twisted, that it is difficult to judge of the staple or length of the fibre. It is so unequally twisted, that it varies in quality from No. 20*s.* to No. 40*s.*, or less technically speaking, some parts of the threads are so fine that 40 hanks would be required to weigh 1lb. whilst others are so coarse, that 20 hanks would make that weight.

"If the same cotton were spun at home with a mule jenny, I think it would make very fair 40*s.*, worth by last Manchester accounts 9¼*d.* to 9⅜*d.* per lb., and 50*s.* 11¼*d.* to 11⅜*d.* per lb. or here at the present market price 4 annas 4 pies for 50*s.*, and for 40*s.* 4 annas 2 pies per morah of 20 hanks."

5. Two small bales of *Kuppas,* grown at Goruckpore, from two kinds of foreign seed received from the Society.—*Presented by J. H. Bridgman, Esq.*

These cottons are supposed to be the produce of Bourbon and Egyptian seed. The first is described as a good cotton, fibre rather

short, but strong and soft, and the wool somewhat easily detached from the seed. The staple of the second is not very long, but it is of good color and pretty strong, and may be considered a fair specimen of the variety acclimated here.

6. Specimen of cotton grown from acclimated seed, in his Garden at Buxar.—*Presented by Captain S. B. Goad.*

This specimen is supposed to be the produce of acclimated New Orleans or Tennessee seed : the color is fair, but fibre somewhat weak, compared with the same grown in Bengal. It is however considered to be a good merchantable cotton, and is likely to find a ready sale in England.

7. Samples of cotton in different states, viz. in pod, *kuppas*, and divested of the seed, the produce of acclimated New Orleans seed.—*Received from the Society's Nursery Garden.*

In a memorandum from the Garden overseer, which accompanied the above samples, it is stated, that three and a half beegahs of ground are occupied by this cultivation. That a maund and a quarter of *kuppas* has already been collected, and more will be shortly available.

8. Two specimens of Thibet blankets, dyed by Munjeet of different shades of crimson.—*Presented by Dr. A. Campbell.*

Publication of the Society's Journal in Parts in lieu of a Monthly Issue.

The first subject that came before the Meeting for discussion, was that relative to the proposed change in the mode of publishing the Society's Journal, which was alluded to at the last Meeting, and postponed for settlement to the present. The Secretary laid on the table a few copies of the eleventh number of the second volume just received from the press, and stated, that the 12th or last number of the volume was now in hand, and would probably be published by the end of the present month, or about four months after the period it should have made its appearance as a monthly Journal. He stated, that this delay had originated in consequence of the amount of original matter placed at the disposal of Society being inadequate to the demand, and, in consequence, the Committee of Papers had recommended, in their minutes, which were read at the last Meeting, that it would be desirable to publish the Journal *in parts* without reference to time, and it was added, that this change would also admit of much greater care in compilation and revision. The Secretary further observed, it was probable that four parts, sufficient to form a good-sized volume, could be got out during the year, should the Meeting sanction the change now proposed.

After some little discussion, it was proposed by Dr. Griffith, seconded by Mr. Storm, and resolved, that the suggestion of the Committee be adopted, and that a Journal *in parts*, be substituted for the former *monthly* issue.

Horticultural Exhibition.

A list of native gardeners to whom prizes to the amount of 100 Rs. were awarded at the show of indigenous and foreign vegetables and fruits held on the 7th instant, was next submitted. The remarks appended to the list mention, that among the vegetables were some good samples of leek, lettuce, asparagus, potatoes, ginger, carrot, and Windsor beans. The two latter, in particular, were well deserving of prizes, as they have been produced out of season. There was only one basket of Brussels' sprouts. The celery and artichoke were inferior, but prizes were given with the view of encouraging the growers to take more pains in future with their cultivation. The maize from American stock is stated to have been good. Of fruits, it is observed, that the leechees, peaches and mangoes were not wanting in quality, but there was a very poor display of them, considering the favorable season for these varieties. The pine-apples were good, as also a basket of melons, the produce of Cabool seed received by the Society from Colonel Stacy in 1840-41. Silver medals were offered for the best samples of grapes and apples, but there was not a single basket of either.

The name of Mr. Richard Dodd was added to the Fruit and Kitchen Garden Committee, on the proposition of Dr. Huffnagle, seconded by Mr. Heatley.

Further particulars regarding Munjeet or Indian Madder.

The Secretary stated, he had the pleasure of submitting additional particulars regarding the culture of, and mode of, dyeing with Munjeet with which he had been favored by Dr. Campbell, the Superintendent of Darjeeling, in continuation of his interesting letter, which was read at the last Meeting.

The best thanks of the Society were given to Dr. Campbell for his communication, and for the samples which accompanied it; the former was referred to the Committee of Papers.

Cotton Culture at the Society's Nursery Garden.

The Secretary intimated, that he had been favored with the following Report on the samples of acclimated New Orleans Cotton, alluded to among the presentations, by a Member of the Society, to whom the institution was already indebted for various useful suggestions. The Report, he was happy to add, was very favorable, and encouraging :—

"The specimens of *Kuppas* and of *cleaned Cotton* from New Orleans seed grown at the Nursery from *acclimated* seed, and of which you ask my opinion, are indeed excellent of their kind in every respect, and afford me further proof (if I needed any) of the correctness of the opinion which I have long entertained, and which I gathered from the results of many experiments made by myself during some years, viz., that the New Orleans seed acclimated here of 1st, 2d and 3d descent, produces a better wool than the seed which we import from the States;—its staple being superior in all respects in *length* and *strength* of fibre, in its greater softness or silkiness of feel, and also in its colour. The samples which you send for my opinion possess these improved properties in a great degree, and is a cotton very well suited for the home markets. Its value I cannot quote, but I should imagine it would bring from 5½*d.* to 5¾*d.* per lb., which were the quotations I find in December last, (prices have since risen,) at Liverpool, for fair to good fair 'New Orleans, Mobile, &c.'

"I may here mention incidentally to you, that on one occasion at Garden Reach, I discovered that the cotton wool of the 3d descent from New Orleans seed *actually verged upon a long stapled cotton,* with the characteristics of the latter in a freeness from the wool of the seed, and the seed of a black or dark colour. I did not carry on the experiment further, which I regret, as I think it likely that with the care I took of the plants (giving them a *Garden* cultivation, and substituting an open or silicious soil for the natural one,) I should have succeeded in producing a *long* stapled cotton from *New Orleans seed* of original importation! I mention this to prove to you, that *acclimated* seed yields better cotton in my opinion than the same (New Orleans) seed produces in the West.

"The pods which you send, resemble those grown by me in all respects, size, colour, &c.

"I do not think the *acclimated* seeds are smaller than these imported, and from which they sprung.

"I think you should make up a bale of this cleaned cotton from acclimated New Orleans seed, and send it home for a particular report."

Dr. Huffnagle, who was present, fully coincided in the opinion expressed in this Report. He stated that, had he not been informed to the contrary, he should have pronounced this cotton to be the produce of the United States.

It was resolved to carry the above suggestion into effect by transmitting a bale of the cotton to the Hon'ble the Court of Directors.

Manufacture of Cloth from the Thread of the Moorghee, (Senseviera Zeylanica.)

The next paper submitted to the Meeting was the following letter from the Secretary to the Chamber of Commerce, in reply to the Society's communication in reference to Miss Davy's suggestion, which was read at the March Meeting, for a small sum of money to be placed at her disposal by the Chamber, with the view of enabling her to prepare a sufficient quantity of thread from the *Moorghee* fibre for an experiment to be made in England to manufacture it into cloth.

To JAMES HUME, ESQ. *Honorary Secretary to the Horticultural and Agricultural Society.*

SIR,—I had the pleasure to lay before the Chamber of Commerce your letter of the 22d ultimo, relating to Miss Davy's experiments in the manufacture of cloth from the thread of the Pine-apple and Moorva.

Appreciating duly the public spirited exertions of that lady in her interesting researches, the Chamber hopes these will meet with all the success they merit, and lead to useful results.

Having no funds applicable to general purposes, the Chamber is not in a position to afford, as a body, pecuniary support to the prosecution of the contemplated experiments; but all propositions involving subscriptions, it has to leave to be entertained by the Members separately as they judge to be right.

The Chamber desires me to express its acknowledgments for your interesting communication. I have, &c.

(Signed) W. LIMOND, *Secy.*

Calcutta, Bengal Chamber of Commerce, April 16, 1844.

The Secretary was requested to communicate to Miss Davy, the result of the Society's application, and to suggest the best means of carrying her wishes into effect.

Communications on various subjects.

1. From S. H. Robinson, Esq. presenting a few brief notes on the cultivation of Sugar-cane in Bengal.

2. From Mr. Ross, Head Gardener H. C. Botanic Garden, presenting a paper on the best mode of propagating various shrubs and plants in India.

3. From Melmoth Hall, Esq. enclosing a tabular statement of the comparative produce of different varieties of wheat grown in England, extracted from a paper of Mr. J. Morton, in the first volume of the English Agricultural Society's Journal.

The above three communications were transferred to the Committee of Papers.

4. From Major T. E. A. Napleton, Secretary Bhauglepore Branch Society, requesting, with reference to the reply from the Secretary to Goverment, that the application of the Branch Society for copies of the plan of the Public Garden to be lithographed at the Government Press may be withdrawn, as they are quite unable to bear the expense of nearly 800 Rs. which, it is stated, would be incurred for the work.

5. From Melmoth Hall, Esq. intimating that all the varieties of wheat and barley (forming portion of a supply which was transmitted to the Society by Dr. Royle in June 1843,) which were sent to him for trial at Goruckpore, failed to germinate. As other kinds sown at the same time and in the same manner and in similar soil have all thriven remarkably well, Mr. Hall cannot account for this failure save in attributing it to some defect in the seed. Mr. Hall adds as follows:—

"Having for the last three years been in the practice of obtaining various flower and other seeds from England per Overland Mail, I may state here, as a warning to any one who may be desirous of doing the same, that if put up in tin boxes, soldered down, the chances are that not one will reach this country alive. There can be no reasonable hope of their doing so. Whereas, if simply put up in little packets, and enclosed in a common letter, the probabilities are that not one will fail, provided common caution is used in drying both seeds and paper. Four-sixths of all seeds sent me in this way have sprung up, but in no case have I succeeded in obtaining a single plant from those packed in tin. They were in fact a mass of putridity when the box was opened."

6. From T. R. Davidson, Esq. intimating that the Society's renewed application to the Court of Directors for occasional supplies of Agricultural seeds, was forwarded by the March Mail, and that the request was recommended to favorable consideration by the Government of India.

7. From Messrs. Veitch and Sons, seedsmen and florists, of Exeter, stating in reply to the Society's order, that a large supply of flower seeds, consisting of 38 varieties, would be dispatched by the April Mail.

For all the foregoing presentations and communications, the thanks of the meeting were accorded.

Metcalfe Hall.

At the close of the Meeting, Mr. Huffnagle enquired as to the probable time in which the Society would take possession of their apartments at the Metcalfe Hall. The Secretary stated that the Hall was on the eve of completion, and that a meeting of the committee would

probably be held in a few days to take into consideration the means of liquidating the amount still due for the building.

(Wednesday, the 12th of June, 1844.)

The Honorable Sir J. P. Grant, President, in the chair.

The minutes of the last General Meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last Meeting were duly elected Members of the Society, viz.

Messrs. H. V. Hathorn, and W. Rehling, and Lieutenant Col. Andrew Hervey.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Samuel Pryce Griffiths, Esq. Merchant, Calcutta,—proposed by Mr. R. Dodd, seconded by the Secretary.

Sydney George Smith, Esq. Civil Service, Bijnore,—proposed by Mr. W. Hammill,—seconded by Mr. William Storm.

Robert Townsend Allan, Esq. Attorney, Calcutta,—proposed by Dr. Huffnagle, seconded by Mr. Storm.

Presentations to the Garden and Museum.

1. A fine supply of artichoke, celery, cauliflower and trefoil (Trigonella corniculata) seed, the produce of Major Napleton's Garden and the Public Garden at Bhauglepore.—*Presented by Major Napleton, on behalf of the Bhauglepore Branch Society.*

2. Specimens of wheat, barley, oats, gram, dhall, safflower and potatoes.—*Presented by Major Napleton, on behalf of the Bhauglepore Society.*

Major Napleton intimates, that the above are the very same samples which carried off the silver medals and money prizes at the last exhibition of their Branch Society, held on the 6th May. The potatoes (nine in number) weigh 3 tolås less than two seers, and were grown in Major Napleton's Garden from Cherra Poonjee and Darjeeling stock. The potatoes were admired by the meeting for their good size and general appearance; the other samples were referred to the Committee for report.

3. A small assortment of flower seeds from the Lucknow Public Garden, consisting of pinks, larkspurs, sweet-pea, geranium, sweet william, primrose, poppy, clarkia, stock, sweet sultaun, &c. &c., and a small box of narcissus bulbs.—*Presented by Capt. G. E. Hollings.*

4. A sample of Tapioca grown and manufactured at his farm at Beerbhoom.—*Presented by Baboo Sumboochunder Ghose.*

The Baboo intimates, that the above is the result of his first experiment, and that if the article prove fit for the market, it is his intention to extend the cultivation this year. The Secretary mentioned that Mr. Speede had reported on this sample to the effect that the color is good, but that it has not been sufficiently fired, and the grains are therefore too small; further, that it wants the crispness of good tapioca, but that this may be remedied by its being properly sun-dried.

5. A quantity of Darjeeling Munjeet seed.—*Presented by Dr. A. Campbell, Superintendent of Darjeeling.*

6. Sample of Munjeet from Luckimpore.—*Presented by Major Jenkins, Commissioner of Assam.*

Major Jenkins mentions that the price at Luckimpore for this Munjeet, is now under 1-8 a maund, and at that price little is brought down, but that any quantity can be had at a little advance.

7. Samples of Nepaul Munjeet in a living and dried state; also fruit of the "Hurra" tree, and leaves of the "Sowah" and "Assura" trees, used by the Nepaulese in the process of dyeing with Munjeet.—*Presented by Major H. M. Lawrence, Resident at Nepaul.*

8. A box containing four kinds of Arracan Rice in a cleaned and uncleaned state.—*Presented by Capt. Bogle, Commissioner of Arracan.*

Some particulars regarding this rice will be found at page 1.

Culture of Carolina Paddy at Arracan.—Non-obtainment of seed by the Society.

In his letter forwarding the samples of grain above alluded to, Capt. Bogle expresses a wish to be furnished by the Society with as large a supply of Carolina Paddy as can be spared. Capt. Bogle observes, that Arracan being a rice-producing country, it has long been his conviction that great benefit would accrue from the introduction of Carolina Paddy. A small quantity which was sent down to him some time ago by the Society, Capt. Bogle mentions, succeeded so admirably, that he has frequently applied for more, but has never been able to get a proper supply; he however considers it a subject of so much importance, that he hopes the Society will give it every attention.

The Secretary intimated, that in consequence of the marked desire expressed by many Members last year to give a trial to the Carolina Paddy in various parts of the country, it was determined to obtain a supply through the friendly Agency of Messrs. Haworth and Hardman. In consequence of the many applications which had lately come before

the Society on the same subject, he had, since the last Meeting, again communicated with Mr. Haworth, whose reply, as given in the following extract, he regretted to observe was unfavorable, and necessitated the postponement of a compliance with the request of Capt. Bogle and of other applicants till next year :—

"I regret to say, I am advised by our Liverpool friends that they 'had not succeeded in obtaining a lot of Carolina Paddy seed for the Society, such as was offered to them being inferior in quality, and not suitable for seed,' therefore, in accordance with the spirit of our instructions none would be sent, as it could not arrive here in time for the sowing season. This will be a great disappointment to the Society, as it is also to us, as we had ordered a considerable quantity for our own cultivation. The original order was lost in the *Memnon*, or it is most likely, the seed would have been procured in time from America, viâ Liverpool."

Additional particulars regarding Munjeet or Indian Madder.

The Secretary mentioned, that in compliance with the request of the Society he had applied to Major Lawrence for some particulars regarding the cultivation and preparation of Munjeet in Nepaul, and the mode of dyeing with it. Since the last Meeting, he had been favoured with a reply from that gentleman, enclosing an interesting communication from Dr. Christie on the subject.

The best thanks of the Meeting were given to Major Lawrence and Dr. Christie for their kind attention to the Society's request. Dr. Christie's communication was referred to the Committee of Papers.

Particulars regarding the Lucknow Public Garden.

Two communications from Capt. Hollings, regarding the seeds and bulbs alluded to among the presentations, with some account of various cultures in the Public Garden at Lucknow were next read. In his first letter, dated 10th March, Capt. Hollings mentions that the fruit had set on the pear trees in their garden for the first time, that very fine strawberries, loquats and artichokes were obtainable; one of the strawberries was exactly a tola in weight, and three seers of fruit were daily obtained from the cultivation; the loquats were fully equal to three tolas. The vine, peach and apple trees were all very promising. Capt. Hollings has been successful in raising many plants from some melon seed brought by Col. Stacy from Candahar, but the Cabool surdah melon seed has not given good returns. The plants from English flower seeds, which were sent us a present from the late Resident, Col. Low, are daily sending forth many beautiful flowers; and the sweet peas, Capt.

Hollings mentions, are as handsome and luxuriant as can be met with in England. Capt. Hollings adds, that in accordance with the promise made in a former communication, he is complying with the requests of several Members of the Society, for seeds and plants from the Public Garden.

Bhauglepore Branch Society.

The papers next submitted were from Major Napleton, Secretary of the Bhauglepore Branch Society. In his first communication (dated 22nd April, which was omitted to be read at the last Meeting.) Major Napleton gives an account of the damage which was done to the Public Garden by a severe hail storm, which had been experienced about a month previous to the date of his letter. Besides this injury, Major Napleton mentions, that the corn fields in the vicinity of the station were in some places beaten down, and fields of fine tobacco nearly destroyed, every leaf having been perforated in several places. Major Napleton refers to the progress which was then making in collecting the seeds for the Parent Society, which have since been received, and are alluded to among the presentations. He states, that among other sorts are six bottles of trefoil seed, the produce of some seed presented to them by Baboo Dwarkanauth Tagore, and gives the following account regarding it:—

"Altogether Dwarkanauth sent me three sorts of clover or trefoil, all English. Two arrived in such a damp state, that they were useless, but a small portion of the third was sound, and from this the seed under notice was obtained.

"The plant grew rapidly and luxuriantly, and attained the height of nearly four feet; the flower proved to be yellow, and the seed crop was abundant. The *Mallees* pronounced it to be the *Piring*, which answers to the *Trigonella corniculata*, vide Piddington, page 88 and Loudon page 644. I enclose a sample of the seed, and we shall be very glad to learn from the Parent Society under what denomination it is to be classed.*

"One thing has been proved, *id est*, that of all the Caubul and English trefoils, this attains much greater perfection, both in plant, and as a seed crop in this part of India; and it appears desirable therefore that it should be more extensively cultivated."

In a communication of a later date received since the last Meeting, Major Napleton encloses an account of the first show of the second year of the institution, which took place on the 6th of May, and at

* Dr. Griffith has little doubt that the seeds are those of the yellow-flowered Melilotus or Medicago.—*Sec.*

which the two silver medals placed at its disposal by the Parent Society, besides money prizes, were awarded for various samples of grain, vegetables, and flowers. Major Napleton adds that since their last report there has been an accession of seven Members, besides several donations in money, seed and plants.

Communications on various Subjects.

1. From John Owen, Esq. presenting an extract from a work in preparation by him on the hill tribes bordering on the N. E. Frontier, shewing the rude method of manufacturing salt practised amongst the Nagas.

2. From G. Tradescant Lay, Esq. Consul at Canton, submitting a paper on the culture of the Mulberry tree in China, translated from a voluminous Chinese work on Universal Geography.

3. From J. Morris, Esq., presenting a MS. Catalogue of Plants growing in the H. C. Botanic Garden, Calcutta, alphabetically arranged, with authorities and Natural Families annexed, 1837, by Mr. J. W. Masters.

Mr. Morris states, that this Catalogue was purchased by him at a public sale, and he presents it to the Society with a view to its publication, should they deem it desirable.

(The above three documents were referred to the Committee of Papers.)

4. From J. O. Price, Esq., Dacca, dated 16th May, applying for a further quantity of foreign cotton seed for trial in that district. Mr. Price also gives the following short acconnt regarding his attempts to cultivate exotic cotton in the vicinity of Siremoodee:—

"In the locality of Siremoodee the Natives grow a considerable quantity of the small Dacca cotton, which led me to think, that the exotic seed would also do well there; for the first two months after planting (which was not until the 27th of December), its growth was very quick, and indeed no cotton could have looked better, but during the month of March it grew very slowly and commenced blossoming when not more than a foot and a half high, showing that the late planting had not allowed it time to arrive at a proper size before the yielding season came on; however in this it is like every plant I have ever cultivated when not planted at a proper season; still in this instance I must admit I was a little disappointed, not having been able to visit that district since the month of March until the other day. I had hoped that it would have been much improved, which, I am sorry to say, was not the case; the person who was left in charge of it having entirely neglected it, and allowed it to become a bed of weeds, which is ever

ruinous to the cotton plant. On examining the bowl I found a small red worm in every bowl, which not only discoloured the cotton, but in a great measure killed the plant; but had the ground been kept clean; this, I think, would not have been the case; but indeed until an experimental Farm is established, and the cultivation under my own eye, I will not be able to judge satisfactorily of the likelihood of success, which I hope Government will soon determine on doing. You will be astonished when I inform you, that the cotton looks best on the poorest soil I have planted it on, but this is occasioned by it being nearest to Dacca, and enabling me to have it cultivated as it should be."

The Secretary informed the Members, that he had sent Mr. Price a portion of the acclimated New Orleans seed, the produce of the Society's Garden, on which so favorable a report was given at the last Meeting.

5. From Dr. Wallich, dated Cape Town, March 30th, enclosing copy of his correspondence with the Rev. Mr. Livingstone at Latakoo, and Messrs. Dickson and Burnie, of Cape Town, towards giving effect to the request of the Society to be furnished with a quantity of the useful and hardy roots and fruits growing wild about Latakoo, and to the North of that place, as determined on at the Meeting of the Society in November last.

6. From Capt. W. W. Dunlop, Secretary of the Branch Society at Cuttack, acknowledging the receipt of a supply of seeds from the Parent Society, and requesting to be furnished with a quantity of Otaheite cane at the proper time of distribution. In reference to the culture of this description of cane in their Public Garden, Capt. Dunlop makes the following remarks:—

"There is some Otaheite cane in the garden here, but I doubt whether it is of the finest kind, as I have been led to understand there are two descriptions of this cane, the one much thicker and of a darker color than the other. The cane was cut in February and after reserving a portion to plant out on new ground in the garden, the remainder (1,000) was handed over to Messrs. Mills and Trevor for distribution in the District. In planting out the sugar cane, I tried two methods. The West Indian one, to put the cane in long pieces into deep furrows as soon as cut, and covering it lightly, watering just sufficiently to damp the earth, failed, as the white ants, attracted by the coolness of the earth destroyed it nearly all. The other method, by cutting the cane into lengths of a foot and a half long, and covering them up with dried straw in a hole dug in soft ground close to a tank, planting out in deep furrows when the sprouts began to shoot, covering lightly with

earth, but *not watering* for three days, succeeded very well. When the shoots were two feet long, many of them were attacked by a small grey grub with a black head, which eat into, and lodged in the centre of the shoot and destroyed it."

7. From Major T. E. Napleton, applying for a supply of various descriptions of seeds for the Bhauglepore Garden.

The Secretary intimated, that the greater part of this request had been complied with.

8. From Messrs. Veitch and Sons, Exeter, advising the despatch of the consignment of flower seeds, ordered last year.

This supply has come to hand, and is now available to Members.

9. From the Secretary to the Society of Arts, returning thanks for a copy of the Annual Report of the Society, for 1842.

Metcalfe Hall.

At the close of the Meeting the following proposition relative to the Metcalfe Hall was made by Mr. Staunton, seconded by Mr. Huffnagle, and unanimously agreed to :—

"That the Secretary of the Society be requested to obtain information from the Metcalfe Hall Committee, and report to the Society regarding the expenditure of the sum voted by this Society towards the erection of the Metcalfe Hall, and to ascertain whether any and what expense beyond the original fixed sum of forty-eight thousand rupees has been incurred."

On the motion of the Secretary, seconded by Mr. W. Storm, Mr. Richard Dodd was elected a Member of the Garden Committee in the room of Mr. Hugon, who has left for Mauritius.

For all the foregoing presentations and communications, the best thanks of the Society were accorded.

THE JOURNAL

OF THE

Agricultural & Horticultural Society

OF

INDIA.

A comparative account of the relative position of Landlords, Tenants, Ryots, Produce, Labor and Wages, in India and England. By A. Sconce, Esq., *Bengal Civil Service.*

[The Committee of Papers have much pleasure in giving publicity to the following communication which, Mr. Sconce states, has been written off from some private notes relating to the returns of Agriculture in India and England, and to the circumstances from which the difference observable springs. He entertains a very decided opinion, that a movement not less earnest and influential than what is going on at home should be made in this country, and that, however imperfectly he has expressed his own opinion, perhaps it may lead to an agitation of the subject, which, he conceives, could not fail to prove beneficial.]

It is my purpose to draw up a comparison of the relative position of landlords, tenants, rents, produce, labour and wages, in India and England. There is something yet to be learned; something to be taught; something to be done by the public on these heads. It is a subject on which, in India, people are pretty well indifferent. Here we have not yet advanced to that state of civilization, in which the poverty of the poor forces itself upon the notice—for the discussion—of the rich. Instead of having to lament our want of foresight at any future day, is there any thing we can take in hand now to alleviate, or if we cannot alleviate the reality,

to postpone coming evils, or which shall suffer the operation of experimental and more soothing measures than haggard impatience, if it come suddenly, would permit.

I begin with rent and produce.

For England, I have not within reach that thorough detail which personal acquaintance with an Indian system and the statistical account of Scotland supply me, as regards this country and Scotland. In Porter's "Progress of
Vol. 1, p. 177. the Nation," the cultivated area of England, in 1827, is shewn to have been 25,632,000 acres. In the
Vol. 3, p. 137. same book, the annual value of landed property, (exclusive of dwelling houses, mines, &c.,) as assessed to the poors' rates in 1841, is stated to be £30,448,991. It is not absolutely accurate to compare the rental of 1841, with the cultivation of 1827, but we approximate the truth. This gross rental distributed over 25,632,000 acres, gives an average rent of £1-3 an acre. I am not aware how much the returns of the income tax exhibit the exact rental of the cultivated land in England to be in excess of the above assessment, and it is of less consequence, for conclusions deducible from so wide data are too general to serve the purposes of a specific and exact comparison.

Mr. Spackman in his statistics, taking the average produce of England and Wales, in wheat, barley, oats, rye, peas, beans, and potatoes, assumes the average annual outturn of an acre to be £6, that is, for the period of about twelve years extending from 1828: and allowing for more recent improvements, he considers the average of 1842 and 1843, to have risen to nearly £7 an acre. Rent is ordinarily considered to be one-fourth of the gross produce. In this case, therefore, gross produce being £7, or Rs. 70, the rent on an average should be £1-15, or Rs. 17 an acre.

As regards rent and produce in the Lothians, I find the
Mr. Laings. following data given in the Atlas Prize Essay, on the authority of Mr. Gregg. The distribution of

the gross produce in that highly improved district is said to be as follows :—

Rent, ...	33
Expences, ...	47
Interest and Profit, ...	20
	100

Mr. Gregg states, that rent there varies from £3-10 to £7 an acre. I will assume an average rent of £4-10 for the purpose of this enquiry. And thus, by the formula just quoted, rent being one-third of the gross produce, the total value of the gross produce (rent being £4-10, or Rs. 45 an acre,) becomes £13-10, or Rs. 135 an acre.

The following statistics of parishes in Scotland I select from the statistical account of Stirlingshire.

In Falkirk parish, rents are calculated in grain, convertible into money according to the prices of the year. Wheat alone is the grain in which the calculation is made. The ordinary grain rent is 10 bushels of wheat per acre. The average produce of an acre is 40 bushels. The maximum money rent in dear years is £4-15; but in recent years the minimum rent, calculated at 50 shillings the quarter, applicable in cheap years, has been the average rent of the district, namely, £3-2-6 per acre, or Rs. 31. At the same price, rent being one-fourth of the produce, the value of the gross produce becomes £12-10, or Rs. 125.

Two estimates are given of the produce of different farms in the parish of Campsie. The details I need not copy; the result is as follows:—

The produce of an inferior farm of 70 acres, rented at £110, is shewn to be worth £470; that is, the average produce per acre yields £6-14, or Rs. 67, the average rent per acre being £1-11, or Rs. 15.

The produce of a better farm of 120 acres rented at £300, is shewn to be £1235. Here the average produce

of an acre is worth £10, or Rs. 100: the average rent being £2-10, or Rs. 25.

In St. Ninian's parish, the rent of the carse land is a grain rent, convertible into money, estimated at about a fourth of the average produce of wheat. This produce is about 5 quarters, and therefore at the not high price of 50 shillings the quarter, the value of the produce is £12-10, or Rs. 125, while the average rent is £3-2, or Rs. 31 per acre.

Mr. Porter quotes from the same work an account of the agricultural produce of the parish of Dundee. 3947 acres give an annual out-turn estimated at £29,912-10; or rather more than £7, or Rs. 70 an acre. The rent in this instance is not quoted, but it may be assumed to be one-fourth of the produce of £1-15, or Rs. 17 per acre.

These instances are sufficient to exhibit the position of an agriculturist at home. How low is the descent when we consider the produce of an Indian field! In this quarter, for instance, the produce, rather above an average, may be stated at 40 *arees* (an *aree* yields about 7 seers of cleaned rice,) of paddy to the local *kanee*, equivalent to 100 *arees* the acre. The value of this produce at the rate of 10 *arees* for the Rupee, is Rs. 10 the acre. Here, as elsewhere, the ryot-farmer retains one-half of the gross out-turn of his fields, and pays one-half in the shape of rent to his superior tenant of whatever grade. I will now insert an abstract, showing at one glance, the contrast between the produce, expressed in money, of land in India and England.

District.	*Produce.*		*Rent.*		*Farmer's Share.*	
Chittagong,	Rs.	10	Rs.	5	Rs.	5
England,	,,	70	,,	17	,,	53
Lothians,	,,	135	,,	45	,,	90
Falkirk,	,,	125	,,	31	,,	93
Campsie,	,,	67	,,	15	,,	52
Ditto,	,,	100	,,	25	,,	75
St. Ninian's,	,,	125	,,	31	,,	93
Dundee,	,,	70	,,	17	,,	53

I have no intention of discussing the principles of revenue assessments. It is rather my purpose to shew, that the land in England yields in money ten times as much as the land in India; and to suggest, that if there be any advantage to be attained by reaching the higher rate; if it improve the condition of the labourer and of the farmer, two classes who, apart from cities and towns, constitute the people of India, then the difference is worth studying, which rates the source of the incomes of this people at a tenth of the whole means which are at this time available in England, to be distributed among those who are dependent on land. If an Indian farmer got the whole produce, he would still be immeasurably behind the home farmer: he would still have to make up the difference between Rs. 10 and Rs. 53; or Rs. 10 and Rs. 90. Indeed, the smaller share which he now enjoys of the gross produce, one-half rather than a fourth, is to him a matter of the greatest moment. Some day it may be admitted, that it is equally so to us; some day when the feeding or starving of the people, when their peace or turbulence affect us more than the construction and maintenance of our personal fortunes; some day, for instance, not now; but when we have grown older, when we have advanced farther in the paths of intelligence and agitation, then, such questions as the fixity of tenure, and the establishment of poor laws may compel us to issue a commission to elucidate the then ancient history of evils which are now green, to acknowledge the existence and trace back the origin of certain rights or vested interests, which now it may be in our power to modify or reject. As I have said, the determination of the ryot farmer's share in his crop is to him no trifling matter; and it will be well if at a future day the lost opportunity to regulate the amount of his interests, or to define the minimum of his interest in his *jote*, be not sensibly appreciated. How is it now with the ryots in Ireland; forty per cent. of the farms there average from 1

to 5 acres.* To relieve them, a commission supported by the best wishes, if not with the entire confidence of the whole empire, has been appointed. On looking nearer home, how little have we to congratulate ourselves on the condition of the people, to whose well-being we have to administer.

I have assumed the produce of land in this quarter to be 100 *arees*, worth 10 Rs. per acre. An *aree* is a measure of capacity, weighing $13\frac{1}{3}$ seers ; 100 *arees* are equal to about 33 maunds. Doubtless the value of the produce of an acre is, under various circumstances, in excess of Rs. 10. Sometimes the land yields two crops ; sometimes market vegetables are grown ; sometimes *sooparee* (betel-nut) ; sometimes oranges ; sometimes pepper ; sometimes tobacco : but when we speak of the agricultural out-turn of an entire province, that general average which is common to the entire population, furnishes the best basis for the discussion of speculative truth.

How comes it then that the produce of an acre in India bears no higher relation to the produce of an acre in Britain than 10 to 70, or to 100, or to 125, or even to 135? If it be a secret, it is worth investigating ; if it be attainable, it is worth attaining ;—that power of economical philosophy which would raise the produce of India tenfold in value, whether the difference be intrinsic and real, or nominal and unsubstantial ; or partly both ; the absolute worth is in favor of the larger denomination. It is easy to conceive how high prices, not raised wages, may be of but equivocal advantage to the capitalist or labourer ; but speaking generally, and comparing a higher standard of value with a lower standard, the higher in itself confers a positive boon on those whose concerns are regulated by its rate. It denotes an elevation in the scale of life ; it places men on the best vantage ground, by giving them the amplest means of supplying their

* Hurkaru, 22d October, 1841.

necessities either from their own markets, or from the markets of the world. On what then is the distinction founded, that describes the produce of an English farm by the number 100, while the Indian farm is described by 10?

It cannot be owing to an actual difference in the value of money in both countries; for were money scarcer and dearer in India, there could be no foreign trade. But it may be that production, and the articles produced are cheap; in other words that wages are low and food cheap; and it is chiefly to the consideration of this point that I would confine myself. Money, rupees, or shillings, or pounds, is only a conventional mode of expressing the relative value of different articles produced in different countries. Though an acre of wheat in England be worth Rs. 100, and in India Rs. 10, it does not mean that the produce in the one case is 40 bushels, in the other 4 bushels; for all that the money value shews, the produce in grain may be nearly equal: and to ascertain the actual relation which the produce of an acre in one country bears to the produce of another, we must have recourse to a standard or denomination common to both. This standard is labour. I look upon the value of labour, as upon the value of any commodity, as being determined first of all by the cost of production. If you cannot go to the expence of producing anything, you cannot have it. The cost of production of labour, is the food of the labourer—the quantity of food by the support of which he lives and works. By enabling him to live, you enable him to work. And it is by the determination of this cost of working; by the determination of the power of an acre of land, in England and in India, to maintain this cost, that we may learn what, in each country, the power amounts to, and what is the worth (not in money but) in labour of the produce of an acre.

It has been calculated by Lord Fitzwilliam, that a labourer, his wife and three children, require weekly two-thirds of a bushel of wheat. The labourer's wages should therefore

provide this support for himself and family. I will suppose an acre to produce 4 quarters, or 32 bushels. At the rate therefore of two-thirds of a bushel per week, thirty-two bushels would be equivalent to 48 weeks' wages. An acre would keep a labourer for 48 weeks.

The approximate exactness of this calculation may be otherwise shewn. In Mr. Tufnell's letter* to the Poor Law Commissioners, many instances are given of the weekly distribution of labourers' wages. The details are given of what is expended on bread, meat, butter, potatoes, and so on. As may be expected, the families being different, taste, frugality and management, or mismanagement, lead to varieties in the mode of expenditure. I will notice the effect of this in another point of view presently; meanwhile let me quote these cases: a man, his wife and six children, consumed 7 gallons of flour; in another case, a man, his wife and four children consumed 6 gallons of flour. Now 7 gallons and 6 gallons weigh respectively 42lbs. and 49lbs., so that the assumption is borne out, of two-thirds of a bushel of wheat, which weigh 40lbs. being requisite for the weekly use of a labourer's family.

In India I assume the weekly consumption of a family to be 21 seers of rice; for instance, for the husband, daily 14 chittacks, for the wife 12 chittacks, for three children 22 chittacks; in all 48 chittacks, or 3 seers daily. I believe most men who have directed their attention to this subject, will admit this estimate to be sufficiently moderate. Now 100 *arees* of paddy produced on an acre, are equivalent to somewhat less than 700 seers of cleaned rice. And thus at the rate of 21 seers weekly, the produce of an acre, 700 seers, will maintain a labourer's family for 33 weeks.

It appears then that if nothing but bread or rice entered into the support of a labourer, the productive power of land in England and India, expressed in the *currency* of labour,

* Sanitary Reports.

would be in the proportion of 48 : 33. That is, while an English acre would be worth 48 weeks' labour, an India acre would be worth 33 weeks' labour. If this proportion were entirely exact; if no item had been left out which ought to be included, all other circumstances being the same, the actual produce of the land in both countries would be represented by the same figures. If an Indian acre produced 33 Rs., an English acre should produce 48 Rs., or as above assumed, the Indian acre giving 10 Rs., the English acre should give 14 Rs. But labour is not maintained by bread or rice only. A labourer lives also by salt, pepper, meat and fish. He may have *bēgoons*, gourds and radishes, turnips and potatoes. Clothes and a house are as necessary as food.

It is of course extremely difficult to determine to what extent allowances shoud be made for such items in a calculation such as this, and I can hope only to approach the truth more nearly, than is done by taking into account merely the main article of food.

Mr. Tufnell, the Assistant Poor Law Commissioner, from whose letter, dated 1st March 1841, I have already quoted, gives various labourers' dietaries, shewing how their weekly wages are expended. In order to shew the sum spent in food, compared with the whole outlay, I give these extracts :—

	Total Weekly Outlay.		*Cost of Bread.*	
	s.	*d.*	*s.*	*d.*
1st case ...	11	9½	8	0
2d ,, ...	17	1½	10	6
3rd ,, ...	10	0	4	6
4th ,, ...	13	2¼	5	6¼
5th ,, ...	5	9	2	2
6th ,, ...	12	9	7	0
7th ,, ...	12	3	8	0
8th ,, ...	10	6	7	0
Total,	93	4¼	52	8¼

Leaving out fractions, the cost of bread amounts to about 55 per cent. of the whole. For every 55 weeks, therefore, that the labourer lived, he would require the equivalent of 45 weeks' labour to expend on articles other than bread. Or the produce to be expended being 48 weeks' labour, it follows by the same proportion, that while 26 weeks' labour, or its equivalent in bread, were being consumed, the labourer required at the same time other commodities equivalent to 22 weeks' labour. If a labourer consumed nothing but bread, it would be correct to say, that in England the produce of an acre would support him for 48 weeks; not allowing for his other wants, it will support him only for 26 weeks. In England therefore it seems, we may say an acre is worth 26 weeks' labour.

As regards the produce of an acre in India, a modification similar, but in a less degree, may be made. I have already expressed the value of an acre at 33 weeks' labour, on the supposition that a labourer was supported by rice alone. He does not require much else. Still he must have salt and condiments, and if it may be, fish. Supposing his wages to be Rs. 2-8 monthly, it will take about Rs. 1-12 to buy himself and family rice, 90 seers, for 30 days' consumption. Possibly, thus, about two-thirds of what he earns is devoted to rice, leaving one-third for other necessaries: and at this rate what I have spoken of as being worth 33 weeks' labour, will be worth 22 weeks' labour. That is, making allowance for all the articles that enter into a labourer's maintenance, the value of the produce of an acre may be said to be 22 weeks' labour; for simultaneously with the consumption of 22 weeks' food, he will use also other things equivalent to 11 weeks' more.

By these deductions, therefore, it seems more nearly correct to say, that expressed in the labour of either country, an acre is worth in England 26 weeks,* in India 22 weeks' labour.

* Assuming an average produce of 40 bushels, or 5 quarters, which is probably much in excess of an ordinary average.

This includes the larger deduction which the different habits of the English labourer require. If like the Indian, he required a deduction of only a third for etceteras, then the proportion would be 32 weeks to 22 weeks.

Can this help me to a solution of the question which I have proposed,—In what consists the real difference between the money value of the produce of land in India and England?—seeing that expressed in that primary medium of exchange, which is common to the wants of all countries, the ratio of the out-turn of an acre is 26: 22. In this latter case, the per centage being 100:84, the difference is only 16 per cent.; in the former case, taking the money value of the produce of an English acre to be only Rs. 70, the difference is 700 per cent. Whether or no this is susceptible of a satisfactory solution; whether or no, if theoretically solved, we can turn the enquiry to a practical and useful purpose, it is at all events something to know that the apparent inferiority of the productive resources of India is not owing to physical, whatever may be said of social and economical influences. On the contrary, the natural capacity of both countries is nearly on a par; and there are other circumstances, which though not of unmixed advantage, tend to direct the operations of the capitalist in India, with greater efficacy and greater profit. In representing the value of an acre by the figures 26 and 22, it places the matter in another light to determine the money value of those periods of labour. It is sufficiently correct to assume the labourer's wages in England to be 10 shillings weekly, or 5 Rs.; and in India Rs. 2-8 monthly, or 10 annas a week; at those rates 26 weeks' labour are remunerated in England by Rs. 130, while 22 weeks' labour in India are remunerated by Rs. 14. It will be understood, that this mode of estimating the produce of land is quite distinct from the purely agricultural question of the most effectual means of raising this produce. It is not pretended, that wages are a specific portion of the gross produce. It is not pretended that the whole gross produce is distributed in the shape of wages.

Only in exhibiting the value of the gross produce of an acre in the common standard of labour, if we express this labour value in the money wages current in the country to which our discussion refers, we strike a very tangible comparison between the relative value of money and produce at different times in the same country, or at the same time in different countries. Thus while speaking of labour only, an acre in India is to an acre in England as 22 : 26; if we express this labour at the average rate of wages, the proportion widens so much as 14 : 130. Here the difference is ninefold. This is a sort of goal placed before the Indian husbandman, which he may strive to reach, to which those whose duty it is to help on, himself helpless, may pioneer his way. Only let there be Rs. 100 for distribution among the Indian agricultural interest instead of Rs. 10, and surely we have an indication, that the landlord may be more affluent, the farmer less embarrassed, the labourer better remunerated.

I have already assumed, for the purpose of illustrating this question, that expressing an English labourer's consumption by 100, 55 of this went to buy him bread, and 45 for other articles of food; and that while an Indian labourer consumed 55 in bread, he required only one-third of this, or 18, for et ceteras. In other words, the wants of an Indian labourer, in the matter of food, were 27 per cent. less than those of the English labourer; or the cost of living of the latter, his natural wages, exceeded that of the former by 27 per cent. It must be admitted, however, that the statement is incomplete. No allowance was made for house rent or for clothes; two very material items affecting the ordinary expenditure of English labourers. It is obvious, that if these charges could be with accuracy taken into account, the disproportion would be more than 27 per cent. The house rent alone of an English labourer at 2 shillings a week, is nearly twice as much as the entire wages of the Indian. Let the monthly wages of the one be 40 shillings, of the other 5 shillings; then add in the above

proportion 27 per cent. to the latter, and the wages would be raised to 7*s*. nearly: but still between 7 shillings and 40 shillings, great disproportion has to be removed; a difference which the habits peculiar to the two countries do not appear by any means sufficient to justify; and more important than these, is the higher scale of prices in general, and of bread in particular. For instance, while an English labourer living for 55 weeks, (to continue the figures already used,) would at the rate of $\frac{2}{3}$d of a bushel weekly, consume 36 bushels of wheat, at the cost of 225*s*, or 112 Rs.; an Indian labourer during the same period would consume 1155 seers of rice at the cost of 23 Rs. However necessary and considerable the Englishman's expenses, incurred in articles other than bread; in buying his bread only, he lays out nearly five times as much as the Indian. And besides this purchase of bread, supposing as before, 225*s*. to be 55 per cent. of his entire outlay, the labourer would have (in England) 184*s*. or 92 Rs. for his bacon, his beef, his sugar, his tea; while in India he would have only 12 Rs. for more than a year's consumption of vegetables and curry stuff; or supposing that the Indian's mode of life is altered, that he uses such things as the Englishman uses, or at all events that his outlay, on other articles than rice, brings his expenses on this head to a par with those of the Englishman; to meet this supposition let me add 27 per cent. to the ordinary wages, which in the case first put he would receive; thus his wages for 55 weeks being 35 Rs., an addition of 27 per cent. Rs 13, would raise the entire wages to Rs 48; and the sum of Rs. 12 ordinarily reserved for condiments and vegetables and meat, would become Rs. 25; so that were the mode of living, and the acquisition of articles necessary to the subsistence of the labourers of both countries assimilated, there would still remain the difference between 25 and 92 to be accounted for; to be secured if desirable, for the one; to be abandoned, if undesirable, by the other.

Whatever may be deficient in my demonstration, I may say probably, it is demonstrable that the difference observable between the money wages of labourers in India and England, arises from two circumstances; first, from the absolute difference in the scale of living, of each; the articles that enter into the necessary consumption of one, being more various, and of a more expensive sort than the articles required by the ordinary habits of the other; and second, from the comparative cheapness in India, of those provisions which principally constitute food. Both circumstances taken together, determine the low rate of Indian wages. I have already written perhaps more than enough on this simple point, and I should have thought it sufficient to say less, but that whatever is to be done to raise, at all events, the nominal wages and prices and profits of India to a grade more commensurate with the proceeds of industry in England, should be based on a clear understanding of the position which the Indian labourer, farmer, and capitalist now occupy. High wages, if they be nominally high, are not necessarily an advantage to the labourer. If high prices precede high wages, the labourer may be worse off than before; two cases strikingly exemplifying this self-evident fact are given by Mr. Tufnell, in the letter to which I have already alluded, and it may not be out of place to quote these examples here; the one is an account of the living of a labourer's family 50 or 60 years ago, at 6 shillings a week; the other in 1837, at 13 shillings a week:—

13*s. per Week.*	*s.*	*d.*	6*s. per Week.*	*s.*	*d.*
5 gallons flour, ...	5	6¼	4½ gallons flour, ...	2	3
2 lb. butter, ...	1	8	grinding ditto, ...	0	5
½ lb. candles, ...	0	3½	7 lb. beef, ...	1	5½
3 lb. cheese, ...	1	6	2½ lb. cheese, ...	0	6
meat, ...	2	0	oatmeal and salt, ...	0	2¼
1¼ lb. sugar, ...	0	10½	1 oz. tea, ...	0	2
2 oz. tea, ...	0	7½	½ lb. sugar, ...	0	3
½ oz. soap, ...	0	3	firing, ...	0	3
pepper and salt, ...	0	2	candles, ...	0	3
1 oz. tobacco, ...	0	3½	soap, ...	0	3
	13	2¼		6	0

In the articles of bread, meat and cheese, it is clear that at the periods referred to, the high price more than neutralized the higher rate of wages, possibly a rise in wages might precede a rise in prices; the labourer having more to spend, would demand more and consume more; the operation of cause and effect in such a case would be of the most satisfactory kind: the labourer, enriched himself, would on the consumption of his wealth, help to enrich others: his wages should rise not only in name, but in reality. Now as a consumer, he is something of a free agent, he and others like him lead the tone of the markets; they are potent agents in determining prices; they are willing, as they are able, to *demand*, what was before supplied to them in stinted doles, measured by the urgency of not starving, rather than by the capacity of plentifulness and peace. A real rise in wages may be accomplished without, but not so surely as with, a rise in nominal wages; or rather in a poor and cheap country where the standard of money wages is low, the condition of the labourer can scarcely ever be improved except by paying him at a richer rate: while in a richer country, where the standard of social life is in every respect higher, and where prices, acting and acted upon, it matters not how, have reached a high scale, the labourer will more probably be benefitted by cheapening to him consumption, than by the possibility of his acquiring still higher wages to meet his current charges.

There is not much that can be done to the Indian labourer by cheapening his food; already his food is at the lowest. So may it be said of his housing; so may it be said of his clothing. If our purpose be to improve his condition, to give him much more of the comforts, even something more of the necessaries of life, we can scarcely grow him cheaper food, or build him a cheaper house: and though it is not so certain that we cannot give him a cheaper *dhotee*, the want is so rare, as not to form a material item with disbursements

of monthly wages. This, however, and some other small things, do form exceptions; salt, for instance, is one of those other things. I have not at my command some of the more recent discussions on that question; but I think the laboured effort of the Salt Board in 1832, to maintain monopoly prices, much to be lamented. The Board, it seems to me, attempted to prove the sheerest paradox,—to prove that a high priced salt was as beneficial to the public as a low priced salt; to prove that the public consumed so much at high prices, that they would not consume more, if they paid less. I speak of a letter addressed to Government on the 26th January 1832. In the 79th paragraph, the Board represent the cost of salt to a coolie to be one-seventy-second (1-72) part of his annual wages; allowing him six seers at the cost of 10 annas, being at the rate of Rs. 4 per maund. But they write, as if the coolie alone required salt: they allow none for his wife or for his children; yet how precisely should this fail in an attempt to lighten the borne burdens of our national industry, if our measures were adapted only to a single workman, irrespective of the interests of those who are dependent on him for support. Ten annas yearly for a labourer himself, make at least 30 annas for himself and family: and every resident in India has not far to inquire, before he shall learn, that, not unfrequently, 30 annas are a whole month's wages. Did the Board calculate that what the labourer would save in salt, if the price were reduced one-half, would buy him a new suit of clothes? Nay, if it were reduced one-third, 10 annas would buy a new *dhotee*, and a new *chadur*: or supposing half the saving went to buy more salt, half might still be reserved for his wife's new gown. These matters are not trifles. Mr. Gladstone stated in the Colonial Quarterly, that English manufactures were consumed in India at the rate of six-pence per head of the population, taking the annual value of the imports to be, 5 millions: a sav-

ing* of 10 annas in a family of five persons, would make the five millions, seven.

They who have taken pains to inform themselves on the salt question, know how thriftily the natives use it. Not as we do, laying an unestimated quantity on the edge of our dinner plates, half for use, half for abuse ; but keeping it in solution, every grain is saved, and is made to minister to the most careful economy. The recent reduction in the whole-sale price of salt, can have scarcely any perceptible effect in lowering the retail prices. Hitherto, in many parts of Eastern Bengal, it has sold for Rs. 4-8, or even Rs. 5 a maund; possibly, but improbably, the future price may be Rs. 4. But eating for himself alone, the labourer, as assumed by the Salt Board, spent 10 annas yearly on salt: out of Calcutta most labourers have families, and as, hot or cold, they partake generally of the same food, a moderate computation would raise the consumption of salt from 6 seers to 18; from 10 annas to 30. One would wish to put the question to the Legislature in as many words, how much or how little of his wages do they require from the labourer; or, to disembarrass the enquiry I might say, from the more contemptible *coolie*, in liquidation of his annual contribution to the salt revenue. Ten annas to a poor man is an object; but if the tax amount to a whole month's income, most dearly have the public earned a deep remission of the present charges.

On the whole, however, it is little we can accomplish to render the current rate of wages more effective. It should be our more earnest duty to raise the rate itself, and with this ultimate object, immediately to increase the value of agricultural produce, so as to provide a larger fund for the remuneration of the labourer. It would be a fearful experiment to attempt this by raising the price of food ; to begin

* The population of the Bengal presidency may be stated at 70,000,000, or 14,000,000 families. A saving of 8 annas, or 1 shilling, in each family on salt, would amount to 70 lakhs of Rupees, or £700,000.

by pinching the labourer, and then paying him for our very wantonness. And how begin? By limiting the supply, and thereby rendering his condition even worse than before. The worst of all systems of practical politics is, that which would make wages oscillate with the rise and fall of food, not food with the rise and fall of wages; which would make food dear in order that wages may be high; not wages high in order that the more easy condition of those paid by wages may lead them to demand more food, and to pay more for it. And in any of the inland districts of Bengal how peculiarly are labourers situated, how hardly treated! The tendency of things is to reduce rather than increase the remuneration for their labour. Take any old thannah* of this district. The lands are all cultivated; the population is full, has been full for ten, twenty and forty years, still numbers increase; there is a greater demand for food; a greater demand for employment without the means of giving more work to those who demand it; the demand exceeds the supply; work is done at a cheaper rate; wages are reduced from 2-8 to Rs. 2, or to 1-8; and how can this be helped? And what is true of one thannah, is true of an entire district, of an entire province. There is an increasing demand for food, keeping prices high; an increasing demand for work, keeping wages low; dear food, low wages, how ill they do assort! I am not going to inculcate a preventive check; to preach to the poor the privileges of the rich to marry and be given in marriage, the prohibition imposed by political economy upon them against taking to themselves wives, against peopling their villages with children. Improvement, then, equal to the increase of the population, if possible in excess of that increase, must spring from the funds devotable to the payment of labour, that is, immediately from the hands of the farmer. Give the farmer an object in

* Local subdivision for Revenue as well as Police purposes.

employing more labourers; give him the opportunity of paying them better, and the Indian coolie may live and let live, as do other coolies throughout the world.

It would be a miserable shift to force the price of those descriptions of produce which constitute the common man's food: to make him pay more for his loaf, that you may possibly return to him the excess in the shape of higher wages. It will be observed, I speak of forcing the price of food, which is a very different thing from the natural rise of price that attends the progressive advancement of Society, if it be not the immediate and perceptible effect of the already attained prosperity of the labourer himself. But if by a simultaneous effort throughout the country, and among the farmers of the country, apart from the personal interest and single and solitary attempts of European planters, the richer products of sugar, flax and hemp were established, it is unquestionable that in reaping even the first harvest, its value would exceed twice or three-fold that of rice; all connected with the soil would necessarily benefit; the landlord receive greater rents, the farmer larger profits, the labourer higher wages. It is possible to conceive that in time, land set apart for the cultivation of rice would be contracted; that it might be brought to market with greater difficulty and in less quantity, hence that its price would be increased; but the change would affect men who were already prepared to meet it, whose wages had already risen, whose general comfort and prosperity were being disseminated throughout all the branches of the agricultural community.

It is by the encouragement which influence can direct, by the rewards which wealth can offer, that so great a revolution in the character of Indian agriculture is to be begun, to be gradually extended, to be finally accomplished, and seated familiarly round the *bheetas* and *khumars* of Indian farmers. Perhaps too much stress has been hitherto laid on the wretched condition of Indian husbandry, as if

that were the cause of the difference in the value of the produce of land in India and England; whereas the difference is owing little to inferior productiveness, and chiefly to the higher prices of produce in England. If therefore we were to confine our efforts to the introduction of better ploughs, and of stronger cattle, to the adoption of more careful tillage, and generally were to confine ourselves to the improvement of the present system, inattentive to the benefit derivable from the introduction of new staple products, however sensible the change in favour of the farmer, we should still withhold the advantage that would certainly result from the growth of articles that would fetch a high price in the Europe market; that would on the whole add very materially to the value of the produce of land, and so, of the land itself; and that would elevate the farmer to a scale, in which his condition might be envied more, and pitied less than at present.

Advanced as the agricultural interest in England is compared with India, it is now more, than that at any former time, that they have discovered at home how much yet remains to be done, to extract from the land the enlarged returns of which it is susceptible; and accordingly while the whole island has been instructed by the Prime Minister himself, as to the necessity of bestirring themselves, all admit the feasibility of accomplishing the improvements which the science of agriculture, partly by successful practice, partly by the expression of conclusive principles, encourages every man to adopt. There is scarcely a county in which by the occasional assemblages of Royal Societies, or by the more regular meetings of plebeian farming clubs, the vast importance of the subject is not steadily proclaimed, where the successful efforts of some are communicated and rewarded; and where others are taught to follow examples which it is as much the interest of individuals as of the nation, should be copied and realized. It would be hard to say that some such effort is not wanted in India

or that the conviction of *our* prime minister, on the subject, should not be as strong as the conviction of Sir Robert Peel. It cannot be thought that the ryot is better able to act for himself than the English farmer; that the improvements necessary in India are more easily attained; that fewer and less strong prejudices have to be overcome; or that here greater intelligence is more than a match for greater difficulties. Then by all means, give him the benefit of assistance, which elsewhere is indispensable. True, the services of our own metropolitan society are invaluable, but it does not profess, and cannot act as an instructor to the tens of thousands of farmers, for whose improvement only do I now write. The agriculture of India is not to be perfected, by the submission of samples grown in European's gardens. In the Mofussil, as well as in the City, organization is wanted: and perennial life, I may add, as well as the sketch of an organized system. Time is wanted, and duty and funds. Time to superintend; duty which cannot evade the superintendence; and funds to ransom the spirit of self-interest and self-improvement from the thraldom in which it is held to prejudice and ignorance.

There is obviously no duty to which a Government can postpone the consideration of feeding the millions, whose human lives are dependent on an adequate supply of food. The fact is unquestionable, and we all know how deplorable, that a nation cannot be left to its own resources, to feed itself. The events which mark the stages of its social progress are too fortuitous to be certainly regulated by the operations of the best (and how much do men differ as to what is the best) political system. For specific events, we must use specific remedies. To attain certain ends, we must employ means calculated to effect our purpose. Possibly, by something now in our power to perform, we may postpone for a generation the necessity of promulgating poor laws. There is obviously nothing in the connexion of India with England that requires us

to run through the experiences of English history; to start with a 43d Elizabeth, and live our two hundred and fifty years before we determine the proper modes of relieving the distresses of the poor. One may assume that in India public poverty has yet to shew itself. Provincial and agrarian poverty, at least, is not looked for. How much, if looked for, might be seen, is another matter. Hitherto, India has been not only an agricultural, but to the extent of its home consumption, a manufacturing country. A piece of British calico is rarely or never seen among the merchandize of an inland *Hât*. The cloths thus exhibited are all home-made, and at this season in particular, when altogether new efforts are made to supersede the hand-looms of India, by carrying the fabrics of Manchester and Glasgow to the *ghât* of every village, some consideration should be shewn for the weavers, whose occupation is about to cease. How easy it is to talk, how delightful to British merchants the anticipation of spreading throughout the washing greens of India, Manchester *dhotees*, and *chadurs* and *sarees!* As if in India now men walked naked, and had to be taught the fashion of wearing clothes, not provided with the means of purchasing them. And having attained this purpose, having so to speak given every manufacturer his man, his many men, so that each wearer has his name enrolled as a customer of a power-loom factory; having done this, are we prepared with measures fitted for lands without work, for stomachs without food, which has resulted from the displacement of home-made, and the introduction of foreign manufactures? If we believe that trade is still susceptible of shocks; that the busiest factories may become untenanted and silent, that the busiest workman may become a spectacle of gaunt, but most reluctant idleness, then we admit that every piece of English manufacture that we sell, carries destitution into an Indian village. Here then is another inducement, another justification, for the State concerning itself in the improvement

of the agriculture of Bengal. It is the declared policy of Great Britain to supply as much of its manufactured goods as can possibly be taken off by the markets of India. We know on the other hand to what this must inevitably lead. We see a policy being daily enforced, which must have the effect of rendering India more exclusively an agricultural country, of withdrawing the livelihood of that portion of the population which at present supplies by far the largest proportion of the clothes worn by the Mofussil community, and of forcing them to seek their food by falling back on the already overstocked agriculture and agricultural labour.

*A Gardener's Calendar for Darjeeling.** *Communicated by* A. Campbell, Esq. *Superintendent of Darjeeling.*

To James Hume Esq., *Honorary Secretary, Agricultural Society.*

My dear Sir,—I have the pleasure to send you a Gardener's Calendar for Darjeeling. It may be interesting to the members of the Society, although very far from being complete.

As yet gardening is still in its infancy at this place; and therefore the calendar is offered more for the purpose of slightly assisting those who commence operations here, than as a sure guide to their proceedings.

Your's truly,

A. Campbell,

Member, Agricultural Society.

Darjeeling, 16*th December,* 1844.

Gardener's Calendar for Darjeeling.

January.—There is not much to be done in the garden this month, the frost is too steady to admit of successful sowings, although it does not in ordinary years kill the

* Elevation of Darjeeling garden grounds 7,000 feet.

growing plants. Peas come into blossom, and go on to seed under nightly frosts, with occasional sleet. Nor does a fall of snow impede their progress in sheltered situations. Delve and manure your ground this month, and protect geraniums and any other tender plants from the frost, by suspending pieces of mat or canvas over them. If it snows heavily, cover in your artichokes to prevent their leaves breaking, also lupins for the same reason. Turnips, carrots, beet and cabbage are our only vegetables this month, except parsley and mint, which are in season throughout the year. The walnuts, oranges, and limes from Sikkim are our only fruits.

February.—Plant some potatoes about the middle of the month, and sow a few vegetable seeds in boxes in the verandah; about the end of it you may sow peas and French beans, after the 15th, as well as radish and cress. Put manure to the strawberry beds, and about the roots of the artichoke plants; also over the rhubarb beds. Turnips, carrots, beet and cabbage sprouts, only from the kitchen garden. Lupins and marigolds from the flower one. Turnip, cabbage, radish, and cauliflower seed stocks are in flower.

March.—Finish the planting of your potatoes this month. Sow peas and beans; put dahlia bulbs in the ground; sow vegetable seeds in boxes under cover, and protect your seedlings as much as possible from a small "turnip fly,"* which is very destructive to them all this month and the next, and in May also, unless there is a good deal of rain. Plant out any seedlings you have raised in February; trim your strawberry plants, and clean about their roots. The peach trees blossom this month and the next, and carry their fruit till September, when they are full grown, but not ripe, although very good for stewing; oranges still in season. The magnolia and the red and white rhododendron flower about

* See account of this insect by Dr. Pearson, in the Transactions of the Agricultural Society, Vol. VII.

the middle and end of the month. Protect your seedlings, young vegetable transplants, flowers and peas, if you can, from hail showers. Turnip, cabbage sprouts, and young radish and cress only for the table.

April.—Sow peas, beans, and French beans, carrot, turnip, lettuce, radish, parsley, cauliflower, and other vegetable seeds; you may also plant potatoes. Sow artichoke seed and rhubarb. Plant out cabbage and cauliflower seedlings; sow dahlia seed, and put their tubers in the ground.

May.—Sow vegetable seeds of sorts, including American squash, and plant out all kinds of seedlings; transplant white clover and dahlias, and generally any plants or flowers you wish to move, except heart's ease which is now seeding. Strawberries (English) come in this month, and the yellow wild raspberry; you may have peas in abundance, also French beans, sallads, turnip and cabbage. Numerous flowers adorn the jungles, and your garden may have roses, the scarlet lily, yellow rhododendron, heart's ease, poppies, larkspurs, snap dragon, pinks, lupins, &c.

June.—Sow radishes, turnips, cabbages, and lettuce; also lupins, sweet pea, and other hardy flower seeds. Make pink, sweet william, and rose cuttings, and plant out dahlia seedlings and nasturtia; transplant white clover, raspberries for green banks, strawberries, rhubarb, flowering and other shrubs. This is the best month for transplanting. The vegetables on the table this month are peas, French beans, turnips, cabbage, radish, cress, cucumber, bhangans, lettuce, new potatoes, artichokes, and rhubarb for tarts. Parsley now and all the year round. The fruits are strawberries (English), and the ground raspberry. Pinks, tulips, sweet william, sweet peas, lupins, mignonette, poppies, heart's ease, roses, snap dragon, larkspurs, &c. are the ornaments of the garden; but a great variety of air plants, and others of exceeding beauty, adorn the neighbouring woods. The heart's ease sheds its seed this month, and during July you

have abundance of young plants of it, for transplanting into beds or borders. The fuschia under cover, flowers this month, and continues to do so till November. In the open air it does not flower so early, and ceases to do so sooner.

July.—You may in the early part of this month sow radish and cress, and a few of the hardier vegetable seeds; but you cannot do much in that way in consequence of the heavy rain; vegetation is rapid, and you will find enough of work in keeping the garden clean. You may plant out strawberry runners, and transplant cabbages, brocoli and cauliflowers. For the table you should have carrots, turnips, radish, cress, cabbage, and American squash, and you may have a few peas and French beans in the early part of it. From the lower elevations of Badamtam, Tugvor, &c., you have fine bhangans, cucumbers, capsicums, and tender Indian corn cones, with inferior love apples, and unripe mangoes for tarts. The ground raspberry is in great abundance, and a good and wholesome fruit eaten with cream and sugar; make jam and jelly of it this month. The black bramble-like raspberry, you also have, but it is of inferior flavor. The small gooseberry-like figs are abundant, eat them when fresh pulled, and without sugar. The forest flowers are the lilac, convolvulus, the gigantic yellow plume-like lily, saxifrages, and biggonias, the orange and purple orchis, with many others. In the garden you have heart's ease, lupins, roses, sweet pea, gerania, evening and large yellow primrose, dahlias, sweet william, hollyoak, mallows, snap dragon, marigolds, &c. &c.

August.—Plant potatoes in fresh ground, or in the ground from which you have been digging them, giving the latter a dose of manure at the time of planting. Towards the end of the month, sow peas, beans, scarlet runners, Spanish and French beans, cabbage seed, turnip, beet, radish, and all the common table vegetables. Take up and store your

early potatoes, as the tops wither after the middle of this month. The vegetables for the table are cabbages, French beans, scarlet runners, radishes, lettuce, parsley, turnips, lal saug, squash, vegetable marrow, asparagus, carrots, and cucumber. The wild fruits are large, and small figs, raspberries, and wild grapes. The large figs are very good stewed in port wine, and pretty good simply dried. The smaller ones are best when fresh plucked. The flowers in this month are abundant in the forest, as well as the garden. Dahlias, pinks, roses, lupins, (blue, yellow and variegated,) mallows, large yellow and evening primroses, sunflowers, rose campion, larkspurs, heart's ease and marigolds are among the latter; honeysuckle, a lilac, and a blue convolvulus and orchideæ, innumerable from the former.

September.—Continue to sow peas, beans, and all table vegetable seeds. Plant out young cabbages, brocoli, cauliflower, and nohl kole. Take up and store the remainder of your first planted potatoes, trim your strawberry beds of their runners and dead leaves. Plant out runners in new beds, and make some rose cuttings. Take up your tulip bulbs. The table vegetables this month, are turnips, carrots, salad, beet root, nohl kole, savoys, cucumber, squash, and love apples; bhangans, capsicums, and pumkins from the neighbouring vallies. The garden flowers as last month.

October.—Sow peas, beans, and all sorts of table vegetable seeds for spring use during the early part of the month. You may still plant out strawberry runners; cut down your rose bushes, and thoroughly weed and clean your grounds and garden for the cold weather. Take up and store the remainder of your potatoe crop by the 15th. You may plant out celery in trenches early in the month, as well as cabbages and nohl kole in drills.

November.—We do very little in the garden this month, as far as sowing is concerned; all our seeds for spring and summer use should be sown before the end of October. We

have carrots, turnips, radishes, beet root, cabbages, savoys, &c., and from Tugvor we get green peas, turnips and radishes; salads from the first sowings after the rains. The gardens suffer during this month from the dryness of the atmosphere during the day, and from the night hoar frosts.

December.—This may be called a blank month, as far as active operations are concerned. We have nightly hoar frosts, and vegetation is nearly at a stand still. The pea crops, however, begin to flower, and the vegetables from the September and October sowings remain healthy, although they do not grow much towards maturity.

In gardens not terraced, there is annually a great loss of the good part of the soil during the rains, which renders it necessary to replenish the ground with vegetable mould manure during this month, so as to give the new soil the benefit of the frost; black mould is procurable in any quantity in the forests about the station. We have all the ordinary vegetables in this month, except peas, which we get from Tugvor.* With little care we could have a good supply of vegetables all the year round; Eastern and South-eastern exposure seem the best for vegetable gardens. Potatoes are planted at Tugvor about the end of this month, and are ready for the table in May.

* About 1200 feet lower than Darjeeling

Correspondence relative to the flourishing state of the Grain Trade of Arracan, with suggestions for its further improvement. By Major Bogle, *Commissioner of Arracan.*

[Communicated by the Government of Bengal.]

To the Honorary Secretary, Agricultural and Horticultural Society.

Revenue.

Sir,—I am directed by the Right Honorable the Governor of Bengal, to append copy of a letter from the Commissioner of Arracan, dated the 11th instant, applying for a quantity of Carolina paddy seed; as to the expediency and best mode of supplying which, His Excellency will be happy to be favored with the views of the Society.

I have, &c.

Cecil Beadon,

Under-Secretary to the Govt. of Bengal.

Fort William, 27th November, 1844.

(Copy.)

No. 79.

From Major A. Bogle, *Commissioner in Arracan, to* F. J. Halliday, *Esq., Secretary to the Government of Bengal, Revenue Department, Fort William.*

Sir,—Rice being the great staple of this province, it has for many years past been my most anxious wish to see a better description of grain introduced, and such steps taken in the cleaning and preparing of the produce for exportation as might materially enhance its value, and adapt it for exportation to the most distant parts of the world.

2d. With this view, I have for several years endeavoured to procure, through the Agricultural and Horticultural Society of Calcutta, a supply of Carolina paddy seed, but I have never succeeded, except to a very limited extent, just sufficient indeed to establish the fact of that grain being admirably suited to the soil and climate of Arracan, and of so

Memorandum accompanying a piece of Teak from Arracan, forwarded by Major A. Bogle. *With a report on its quality, by Captain* H. Goodwyn, *Bengal Engineers.*

The teak wood, of which I send you a sample, is considered to be very fine and superior to that of Moulmein. It was cut up the Kaladyne river, a noble stream which falls into the sea at Akyab, and the pity is, that there is not more of it. The existence of teak at the place where this was found has long been known, and last year I obtained a tree from it, but the difficulty in getting it down to the river-side, and then floating it 100 miles to this place, prevented my getting more. A few months ago, an enterprising merchant of this place conceived it to be practicable to form a settlement amongst the hills, and fell teak timbers at a remunerating profit, but the locality having since been visited by my Junior Assistant, Lieutenant Hopkinson, it is found that the trees are few in number, much scattered, and generally too small to be of much value; and moreover, that the natural obstacles opposed to their removal to the river-side are of too formidable a nature to warrant the hope of any real benefit being derived from the teak of the Kaladyne. There are, however, many other very valuable descriptions of timber procurable in the interior of Arracan, which may be felled and exported with advantage.

The specimen of the teak sent by you for examination, appears to be a tough and strong wood, adapted, I should imagine, for ship purposes, as from its oily nature, iron will not easily corrode in it. It will do for furniture too I should think.

Sp. gravity about ·830. Compared with oak as a standard @ 100, its properties appear to be

Stiffness or resistance to flexure, ...	98
Strength or resistance to fracture, ...	104
Toughness, ...	94

The test was a difficult one, as fracture took place at a knot, but judging from the weight which produced deflection and fracture, the above is an approximation to truth.

Fracture was produced by 3052 lbs. Deflection of one inch with 1260 lbs. The piece subjected to trial, was 2 feet long and 2 inches square.

5th December, 1844.

Memorandum accompanying a sample of Tobacco from Sandoway, in the province of Arracan. By Captain A. P. Phayre, *Senior Assistant to the Commissioner of Arracan.*

[This memorandum was drawn up by Captain Phayre, at the request of Major Bogle, Commissioner of Arracan, who conceives* that although, at present, it would be difficult to procure any large quantity of the *very finest kind* of tobacco, similar to the sample sent by him, yet he has not the least doubt that were the demand large and steady, the supply would be very considerable. Major Bogle states, that of the *ordinary* description of Sandoway tobacco, which is an article of a very excellent quality, several thousands of maunds may be procured at the proper season; and having a perfect recollection that, when he was an Assistant at Sandoway, many years ago, plains which are now devoted to rice cultivation were then covered with the tobacco plant, which he has known to sell at 16 and 20 Rs. per maund, he is confident that the district is capable of supplying immense quantities. Major Bogle further observes, that Sandoway is not the only part of Arracan which produces a superior tobacco, but that every stream in the province does the same; and that the population is now increasing so rapidly, that as soon as a great demand for any agricultural product may spring up, it is sure to be met by great extension in the cultivation of the particular article required, and it is difficult to assign the ultimate limit of the supply. "In point of quality," adds Major Bogle, "I believe few parts of India can produce a more delicate tobacco than is raised here, and I am surprised that it is not better known, and more sought after."]

This is a sample of the best sort of Sandoway tobacco.† It is made up for sale in bundles, without much regard to

* Major Bogle, in a letter to the Secretary, forwarding the Memorandum.

† Mr. John Rose, (firm of J. Vanzandyke and Co. tobacconists,) pronounces this specimen to be the finest he has ever seen from Sandoway. He thinks,

weight, like the accompanying sample. This contains four bundles, and weighs about $10\frac{1}{2}$ seers, Bengal weight. It was procured in the town of Sandoway, and cost, delivered at my house, Rs. 2 : 10. This has been the average price of this sort of tobacco for the last four or five years, being at the rate of Rs. 10 : 8 per Bengal maund.

This tobacco was grown, as is all of the best sort, on the banks of the Sandoway river, about 20 miles by water above the town, and about 30 by water from the sea. The land is above the influence of the tides, but is flooded in the rains. It is chiefly grown by persons who go there for the purpose, during the proper season, from the vicinity of this town. The tobacco is to be procured from these cultivators in small quantities from each. Not more than from 50 to 60 maunds of the best sort could be procured in one season. The proper period for purchasing is in May and June. This best sort of tobacco is said to be produced by pruning the plants, and not allowing more than six or seven leaves to remain on each stalk. The usual native traders from Cox's Bazaar and Ramree have now arrived to make their purchases, being somewhat late this season ; but they chiefly look out for the inferior tobacco, the leaves of which are much smaller than these, and fetch here not more than from 4 to 6 Rs. per maund.

The Sandoway tobacco has now I understand got a bad name in Bengal, in consequence of the inferior sorts having been mixed up with the superior. If a proper selection were made, there is no doubt but tobacco here would be found to suit Europeans remarkably well.

All that would be necessary to secure, say 50 maunds of this tobacco, would be to depute an intelligent native to Sandoway in the months of May and June to go among the

however, that by the application of proper manure, and a judicious pruning of the plant, a leaf of much finer texture, with much smaller ribs, would be produced, and thereby a very easy drawing cigar could be made from it.

cultivators, and pick out their best leaf. For the present season it is perhaps too late to secure more than 20 or 30 maunds. No difficulty would be found in dealing with the cultivators. The tobacco could be conveyed hence in small boats to Kyouk-Phyoo for shipment. There is no export or other duty.

It must be remembered, that if a sudden demand were made for 50 or 60 maunds of the best tobacco, a quantity never perhaps sought for before all at once, that prices might range higher than the average I have here given; viz. 10 : 8 per maund.

Sandoway, August, 1844.

Particulars regarding the fibrous properties of the Jeetee Plant; (Asclepias tenacissima, Roxburgh,*) communicated by* C. B. Taylor, *Esq. With a Report on the strength of Rope made therefrom in comparison with other fibrous substances; presented by Captain* T. E. Rogers, *Master Attendant.*

To James Hume, *Esq., Honorary Secretary, Agricultural and Horticultural Society.*

Rajharra Colliery, Palamow, 12th November, 1844

My dear Sir,

About a month ago I observed some of my boatmen twisting a substance into thread, which had much the appearance of silk, and which I had never seen before; they called it *chittee*, and informed me, that it was the fibres of a small creeper found growing spontaneously in the jungle, and which they made nets of, finding it much stronger and more durable than hemp, and not so liable to rot by being kept in water. I employed the boatmen to collect a quantity of the filaments for me, but for which they charged me about 2 rupees a seer; this price is so high, that it could scarcely be converted to any useful purpose; but this obstacle may be overcome, as the creeper takes only three or four months to grow, and it could therefore, I think, be advantageously raised from seed in a field. The seed gets ripe and ready

for gathering in January; part of the *chittee* collected by the boatmen for me, I have had made into a small rope 3 feet in length, and which I forward to you by this day's dâk banghy, also a sample of the filaments, with a few pieces of the creeper itself. The rope I think you will find very strong, but having no English rope by me, am unable to put it to the test; this I must leave for you to do. To separate the filaments from the wood, the creeper, after being plucked, is allowed to dry, and then broken into pieces of a foot in length, it is then steeped in water for about an hour or an hour and a half, which renders the separation of the rind or skin from the wood of easy accomplishment; the fine silky filaments will be found adhering to the inside of the rind or skin, and which can be readily separated by the fingers; but this must be done carefully.

15*th Nov.* 1844.—When I wrote you on the 12th instant, I was under the impression, that the "*chittee creeper,*" from which I obtained the fibres for making the rope forwarded to you by dâk banghy, was unknown, but on a further perusal of the work from which I obtained the information relative to the *Nerium Indigo,* and which I had only partially looked at previously, I discovered my error. On reading the chapter treating of "Fibres applicable to Cordage," it appears, that the *chittee* had not escaped the penetrating and scientific researches of Dr. Roxburgh, as you will perceive by the following extract:—

"Mr. W. Roxburgh in an excursion among the Rajemahl hills, observed the bowstrings of the natives to be made of a remarkably strong and beautiful fibre. He learnt that these strings usually lasted five years, though in constant use and exposed to all the vicissitudes of the weather. His attention was awakened to the subject, and he was sedulous in his enquiries after the plant which produced this valuable material, uniting strength, durability, and elasticity. He found on examining the plant called *jeetee* by the natives, that it was a species of Asclepias, to which he gave the name of the bowstring creeper.

It is a twining plant with few or no branches, having leaves growing opposite on hairy foot stalks, and at a distance from each other. The

fibres are obtained by stripping off the bark from the tender succulent shoots, after they have been exposed to the sun for a day, in order to evaporate a milky juice which exudes from the stalk. The only implements which are then used to cleanse the fibres are the finger nails, and those persons who have been provident enough to keep these very long, expeditiously scrape the pulpy parts away; one man being so provided, being able to cleanse a considerable quantity of fibres in a day. According to Dr. Roxburgh, the fibres of this plant are the strongest of any yet known.

I should have told you in my last letter, that the *chittee creeper* is cut down the middle, and divided into two pieces after it has been plucked, and before it has been dried or steeped in water; this I suspect makes it more easy to strip off the bark without breaking it.

To James Hume, *Esq., Honorary Secretary, Agricultural and Horticultural Society.*

Bankshall, 31st, December 1844.

My dear Sir,—I have the pleasure to acknowledge the receipt of your note of the 30th November, with which you forwarded a specimen of *jeetee* rope, and requesting, that an experiment might be made of its strength as compared with other rope of similar size.

I now beg to forward to you the result of the experiment, from which it appears, that the specimen sent by you does not support the high character anticipated. On inspection of the sample sent for trial, I am of opinion, that if the yarns had been more easily laid up, the result would have been somewhat different, but not to such an extent as to place it nearly on an equality with rope made from good Europe or Manilla hemp. I shall, however, be happy to make trial of any other specimens you may be able to procure.

Believe me, &c.

T. E. Rogers.

* Library of Entertaining Knowledge, Vegetable Substances, Vol. 3, Chapter vi, page 106.

Report of proof of Balasore or Moorgahvi, Arracan, Deyrah and Jeetee Hemp Rope, "in juxtaposition," with different descriptions of Europe, Manilla, New Zealand, Sunn, and Coir Rope.

Description of Rope.	Size of Rope.	Length of Sample.	Rope stretched with weight of scale 455 lbs.	Rope lengthened before breaking.	Weight at which the Rope broke.	Where broken.	Time during which experiment continued.	Remarks.
Moorgahvi, ...	2 In.	6 Ft.	5 In.	13 In.	1175 lbs.	Centre.	1 Min.	10 Yarns on a Strand.
Ditto, (tarred,)	ditto,	ditto,	$3\frac{1}{2}$ do.	$9\frac{1}{2}$ do.	1063 do.	ditto,	ditto,	Ditto ditto.
*Arracan, ...	ditto,	3 ft. 11 in.	2 do.	9 do.	2231 do.	ditto,	ditto,	12 Ditto ditto.
*Deyrah, ...	ditto,	3 do. 10 do.	3 do.	$7\frac{1}{2}$ do.	2519 do	Upper splice,	2 do.	Ditto ditto.
Europe, (Patent,)	ditto,	6 do. $1\frac{1}{2}$ do.	$2\frac{2}{3}$ do.	$10\frac{1}{3}$ do.	2655 do.	Centre,	3 ditto,	16 Ditto ditto.
Ditto, (Fresh,)	ditto,	6 do. $1\frac{1}{2}$ do.	$3\frac{1}{2}$ do.	$10\frac{2}{3}$ do.	2463 do.	ditto,	3 ditto,	9 Ditto ditto.
Ditto, (twice laid,)	ditto,	6 do. $1\frac{1}{2}$ do.	$3\frac{1}{4}$ do.	7 do.	1295 do.	ditto,	$1\frac{1}{2}$ do.	7 Ditto ditto.
Ditto, (ditto,)	ditto,	6 do. $1\frac{1}{2}$ do.	3 do.	$8\frac{2}{3}$ do.	1351 do.	ditto,	$4\frac{1}{2}$ do.	Ditto ditto.
Manilla, (plain,)	ditto,	6 do. 2 do.	$2\frac{1}{2}$ do.	$11\frac{1}{2}$ do.	2731 do.	ditto,	5 ditto,	8 Ditto ditto.
Ditto, (tarred,)	ditto,	6 do.	$3\frac{1}{3}$ do.	$13\frac{1}{2}$ do.	1712 do.	ditto,	2 ditto,	Ditto ditto.
*New Zealand, ...	ditto,	6 do. $1\frac{1}{2}$ do.	4 do.	$10\frac{1}{2}$ do.	2591 do.	ditto,	4 ditto,	14 Ditto ditto.
Sunn, (plain,)	ditto,	6 do.	$5\frac{1}{2}$ do.	$17\frac{1}{2}$ do.	2679 do.	ditto,	$3\frac{1}{2}$ do.	11 Ditto ditto.
Ditto, (tarred,)	ditto,	6 do.	5 do.	$13\frac{5}{6}$ do.	2239 do.	ditto,	3 ditto,	9 Ditto ditto.
Moorgahvi, (plain,)	$1\frac{1}{2}$ do.	6 do. 3 do.	$5\frac{1}{2}$ do.	$9\frac{1}{2}$ do.	875 do.	ditto,	$\frac{1}{2}$ do.	6 Ditto ditto.
Ditto, (tarred,)	ditto,	6 do. 1 do.	6 do.	10 do.	711 do.	ditto,	$\frac{1}{4}$ do.	7 Ditto ditto.

Report of Proof of Balasore or Moorgahvi, Arracan, Deyrah, and Jeetee Hemp Rope, "in juxtaposition," with different descriptions of Europe, Manilla, New Zealand, Sunn, and Coir Rope.—(Continued.)

Description of Rope.	Size of Rope.	Length of Sample.	Rope stretched with weight of scale 456 lbs.	Rope lengthened before breaking.	Weight at which the Rope broke.	Where broken.	Time during which experiment continued.	Remarks.
Jeetee, (plain,)	$1\frac{1}{2}$ In.	5 ft. 6 in.	$12\frac{2}{3}$ In.	15 In.	903 lbs.	Centre.	1 Min,	4 Yarns on a Strand.
Europe, (Patt.,)	ditto,	6 do. 1 do.	4 do.	$10\frac{1}{4}$ do.	1743 do.	ditto,	4 ditto,	10 Ditto ditto.
Ditto, (Fresh,)	ditto,	6 do. $1\frac{1}{2}$ do.	4 do.	$9\frac{1}{3}$ do.	1967 do.	ditto,	2 ditto,	7 Ditto ditto.
Ditto, (twice laid,)	ditto,	6 do. 1 do.	$2\frac{1}{2}$ do.	6 do.	1214 do.	ditto,	1 ditto,	6 Ditto ditto.
Ditto, (ditto,) No. 2, ...	ditto,	6 do. 3 do.	$3\frac{1}{2}$ do.	$6\frac{1}{2}$ do.	871 do.	ditto,	1 ditto,	5 Ditto ditto.
Manilla, (plain,)	ditto,	6 do. $1\frac{1}{2}$ do.	7 do.	13 do.	1431 do.	ditto,	$1\frac{1}{4}$ do.	5 Ditto ditto.
Ditto, (tarred,)	ditto,	6 do. 1 do.	$4\frac{1}{2}$ do.	9 do.	1463 do.	ditto,	1 ditto,	6 Ditto ditto.
*New Zealand, (tarred,)	ditto,	6 do. $\frac{1}{2}$ do.	4 do.	8 do.	2231 do.	ditto,	4 ditto,	10 Ditto ditto.
Sunn, (plain,)	ditto,	6 do.	7 do.	$13\frac{1}{2}$ do.	1607 do.	ditto,	$1\frac{1}{2}$ do.	6 Ditto ditto.
Ditto, (tarred,)	ditto,	6 do.	5 do.	$11\frac{1}{2}$ do.	1703 do.	ditto,	$1\frac{1}{2}$ do.	7 Ditto ditto.
Coir, (plain,)	ditto,	6 do. 2 do.		32 do.	823 do.	ditto,	$1\frac{1}{2}$ do.	12 Ditto ditto.

N. B.—The results in the foregoing Report are the average of three separate experiments with each description of Rope, with exception to those Samples marked with an asterisk (*), of which only one trial was made.

Abstract of the foregoing Proof in the order of Strength and Elasticity.

No. of Sample.	STRENGTH. 2-inch Rope. Names.	Weight at which broken.	STRENGTH. 1½-inch Rope. Names.	Weight at which broken.	ELASTICITY. 2-inch Rope. Names.	Length stretched before breaking	ELASTICITY. 1½-inch Rope. Names.	Length stretched before breaking
		lbs.		lbs.		Inches.		Inches.
1	Manilla, (white,) ...	2731	New Zealand, ...	2231	Sunn, (white,) ...	17½	Coir, (plain,) ...	32
2	Sunn, (ditto.) ...	2679	Europe, (1839,) ...	1967	Ditto, (tarred,) ...	13⅚	Jeetee, ...	15
3	Europe, (Pat.) ...	2655	Ditto, (Pat.) ...	1743	Manilla, (tarred,) ...	13½	Sunn, (white,) ...	13½
4	New Zealand, ...	2591	Sunn, (tarred,) ...	1703	Moorgahvi, (white,)	13	Manilla, (white,) ...	13
5	Deyrah, ...	2519	Ditto, (white,) ...	1607	Manilla, (white,) ...	11½	Sunn, (tarred,) ...	11½
6	Europe (1839,) ...	2463	Manilla, (tarred,) ...	1463	Europe (1839,) ...	10⅔	Europe, (Pat.) ...	10¼
7	Sunn, (tarred,) ...	2239	Ditto, (white,) ...	1431	New Zealand, ...	10½	Moorgahvi, (tarred,)	10
8	Arracan, ...	2231	Europe, (twice laid,)	1214	Europe, (Pat.) ...	10⅓	Ditto, (white,) ...	9½
9	Manilla, (tarred,) ...	1712	Jeetee, ...	903	Moorgahvi, (tarred,)	9½	Europe, (1839,) ...	9½
10	Europe, (twice laid,)	1351	Moorgahvi, (white.)	875	Arracan, ...	9	Manilla, (tarred,) ...	9
11	Ditto ditto,... ...	1295	Europe, (twice laid,)	871	Europe, (twice laid,)	8⅔	New Zealand, ...	8
12	Moorgahvi, (white,)	1175	Coir, (plain,) ...	823	Deyrah, ...	7⅓	Europe, (twice laid,)	6½
13	Ditto, (tarred,) ...	1063	Moorgahvi, (tarred,)	711	Europe, (twice laid,)	7	Ditto ditto,... ...	6

MASTER ATTENDANT'S OFFICE,
The 30th December, 1844.

A. B. CLAPPERTON.
1st Assist. to the Master Attendant.

MEMORANDUM.

These results are a portion of an extensive series of experiments undertaken in the year 1840, in compliance with the orders of the Marine Board, contained in Mr. Secretary Greenlaw's letter, No. 175, dated 7th October 1839, to ascertain the strength of rope made from the Moorgahvi hemp, forwarded by Captain Bond from Balasore, in *juxta position* with other description of rope now in use. These experiments were interrupted by the absence of the First Assistant Master Attendant on sick leave, and no report has yet been submitted. A set of trials on a small scale, with reference to the Moorgahvi, was noticed in the Journal of the Agricultural and Horticultural Society, vol. 3, part 1, page 23, in a correspondence with Lieutenant Colonel Irvine, C.B., Acting Superintendent of Marine.

2d. The samples of Arracan and Deyrah hemp were forwarded for experiment by the late Secretary to the Society, Dr. Spry, and laid up in 2-inch rope in November 1841; but the experiments were again interrupted by the death of the late Master Attendant, Captain Harington, in that month, and these samples were not submitted for trial till the 18th December 1844, at the same time, as the small samples of *jeetee*, forwarded by Mr. Hume, the Honorary Secretary.

3rd. It will be seen from the abstract, that amongst the 13 samples of the 2-inch rope, the Deyrah hemp stands the 5th in strength and the 12th in elasticity; the Arracan hemp is 8th in strength and the 10th in elasticity. Amongst the same number of samples of 1½-inch rope, the *jeetee* is the 9th in strength and the 2nd in elasticity, being only surpassed by untarred coir rope; this may possibly be caused by its being laid up by hand. The Moorgahvi, both tarred and white, stands the lowest in the 2-inch rope for strength; the elasticity of the untarred specimen is much greater than that of the tarred, being the 4th and

the 9th on the list respectively; the results of the specimen of $1\frac{1}{2}$-inch Moorgahvi are nearly the same.

4th. It is evident that the sample of *jeetee*, forwarded by Mr. Hume, is too small for experiment, and that if a quantity of the hemp or fibre could be procured, so as to be laid up in Calcutta, to the size of from 4 to 2-inches, the trials of strength would be more decisive and satisfactory.

A. B. CLAPPERTON,
1st Assistant to the Master Attendant.

Master Attendant's Office, 30*th December*, 1844.

Observations on specimens of Sugar, Soils, and Indigo-giving Plants from the Tenasserim coast; communicated by EDWARD O'RILEY, *Esq. With an analysis of the Soils, by Mr.* J. G. SCOTT, *of the Honorable Company's Dispensary.*

MY DEAR SIR,—I have to tender you many apologies for not noticing your esteemed letter of 27th of June last ere this, but the fact is, that my time has been so much occupied that I could not do so, and at the same time render any information to the Society that might be deemed either interesting or instructive. A few days of leisure, however, afford me the opportunity of thanking you for your kind communication as above, as well as for the arrow-root bulbs, and the favourable reports you enclosed of the sample of sugar I forwarded for report.* You ask " whether the sugar in question was

* The sample of sugar referred to by Mr. O'Riley, was submitted at the general meeting of the Society, on the 10th July, 1844, and the minute of the Members of the Committee was handed in at the same time, expressive of their opinion, that it is an excellent sample of raw Muscavado sugar, of good colour, and that its value (quoted at from 8-8 to 9 Rs. per maund) would be materially enhanced if the molasses could be more extracted without injury to the grain. One member considers it to resemble the strongest Muscavado sugar from the island of Jamaica, and another observes, that in point of granulation and strength, it surpasses any thing he has seen of *Bengal* production, excepting perhaps that of the Dhoba works, and from the Beerbhoom district.

manufactured by the common process, or by that of the vacuum pan." In answer I beg to say, that I have none other but the open pan system in my establishment, and that the sugar in question is the produce of the *common native cane,* which after several trials, at the commencement of my career on this coast, I found to produce a much superior article in *grain* than the other kinds of imported cane, principally Otaheite. Since that period, however, the *foreign* descriptions of the plant have been considerably increased, and from their healthy and hardy appearance during the heat of the dry season, I have great hopes that they have become acclimated; but this shall form the subject of future investigation.

Your remarks on the subject of the Otaheite cane in Tirhoot are very interesting: the same amount of produce, or even more on the average per acre of new soil, on this coast, may be obtained, with the very material point in its favour *of being entirely free from the attacks of white ants,* a subject which appears to oppose very serious obstacles to the extended cultivation of the Otaheite plant in the Upper Provinces. I have given this point a good deal of attention of late, and after a personal inspection of all the Otaheite cane grown in the vicinity, I have not found a single patch injured by the attacks of those insects, notwithstanding the fact of their abounding in the vicinity, and in many cases *literally in the cane fields,* where they may be seen covering the stumps of the trees left after burning the new jungle. It is a singular fact, that I have never heard a complaint made by the native cultivators of the ravages of white ants, not only in regard to the Otaheite cane, but of all the kinds in cultivation. To afford every information in regard to the nature and properties of the soil, the produce of which is exempt from this pest, I have the pleasure of forwarding in charge of Capt. Russell of the *Ganges*, a box of the soil taken from one of the gardens,

which is about the average of all the cultivation in this vicinity. In the same box are two paper parcels from Major Macfarquhar, at Tavoy, containing specimens of the soil of his garden, in which he states, "that Otaheite cane has been growing for the last 5 or 6 years uninjured, although there are legions of white ants in every direction." I trust that an examination of these soils may lead to some data, that may be useful in guiding future operations in this description of cultivation.

I find that by placing a good layer of common charcoal from the furnaces, under all materials of wood, subject to the ravages of the white ants, they are well-preserved, and in no case have I discovered any damage when this precaution has been taken; perhaps the application of the refuse of the furnaces to the soil, when opening the furrows previous to planting, might be attended with success in this respect; at all events it is worth the trial.

In the same box I forward two specimens of sugar manufactured at Tavoy from the native cane, by the very rude process in use with the natives, which consists of evaporating the juice as it is received from the mill, without the application of temper, or any other assistance in separating the feculence but that of heat; both specimens have been exposed repeatedly during the last protracted S.W. monsoon, and have suffered very little from the moisture of the atmosphere. Major Macfarquhar will feel obliged for an opinion as to the qualities of these musters,* and requests me further to inquire, if you can afford him any information as to the method of protecting mango and other fruit trees

* These musters are valued by the Committee at 6 Rs. and 8 Rs. per maund. They are both considered specimens of excellent strong-grained sugars, and although the colour of both qualities is low, their strength makes them worth the sums above named. One of the members is of opinion, that their values would be considerably enhanced if the molasses principle could have been extracted without injuring the grain, particularly the canister specimen which, in point of granulation, resembles a vacuum-pan sugar.

from the attacks of the *borers*, which are very destructive at Tavoy.*

I have also the pleasure of forwarding by this opportunity, three specimens of indigo-plants in use with the natives of this coast, for the purpose of dyeing their yarn previous to weaving.

No. 1† is the same plant as the one in common use as the cultivated plant of Bengal. It is permitted to grow to its full size, and the *leaves only* are used for the preparation of indigo, which are taken from the tree several times during the rainy season. Some of the plants attain a thickness of 6 to 8 inches in circumference.

No. 2‡ is a *parasitical creeper*, possessing very strong qualities of the dye, which exudes on pressure between the

* Huldee or sulphur are stated to be good antidotes to the depredations of the *borer*. If the tree has been attacked by it, the powder should be put in the holes. If unattacked, it would be well to plaster the trunk with a layer of huldee mixed with any kind of oil to make it stick.

† Mr. Griffith thinks that this leguminous plant is an Indigofera.

‡ This Mr. Griffith believes to be the Marsdenia tinctoria, *Brown*: Asclepias tinctoria, *Roxb.* In his History of Sumatra, Marsden alludes to this plant in the following words:—

"There is another kind of Indigo, called in Sumatra *taram akar*, which appears to be peculiar to that country, and was totally unknown to botanists to whom I shewed the leaves upon my return to England in the beginning of the year 1780. The common kind is known to have small pinnated leaves growing on stalks imperfectly ligneous. This on the contrary, is a vine, or climbing plant, with leaves from three to five inches in length, thin, of a dark green, and in the dried state discoloured with blue stains. It yields the same dye as the former sort; they are prepared also in the same manner, and used indiscriminately, no preference being given to the one above the other, as the natives informed me; excepting inasmuch as the *taram akar*, by reason of the largeness of the foliage, yields a greater proportion of sediment. Conceiving it might prove a valuable plant in our colonies, and that it was of importance in the first instance that its identity and class should be accurately ascertained, I procured specimens of its fructification, and deposited them in the rich and extensively useful collection of my friend Sir Joseph Banks. In a paper on the Asclepiadeæ, highly interesting to botanical science, communicated by Mr. Robert Brown, (who has lately explored the vegetable productions of New Holland and other parts of the east,) to the Wernerian Society of Edinburgh, and printed in their Transactions, he has done me the honor of naming the genus to which this plant belongs, Marsdenia, and this particular species *Marsdenia tinctoria*."

fingers; the natives have no other process of extracting it but by means of lime added in solution to the steeped plant. It is found in the jungles, but not in any large quantity, and may be propagated by cuttings placed against any jungle tree.

No. 3* is the indigo plant peculiar to this coast, and in most general use with the natives, who keep small patches near their houses, and make use of the leaves and tops of the plant; its produce is considered superior to No. 2 and equal to No. 1. The plant thrives well in shady spots with a moist soil, and is propagated by slips which thrive exceedingly well, and produce 3 or 4 crops of leaves during the monsoon. If this plant would answer in Bengal, any amount of seedlings required could be obtained from this, and I should feel great pleasure in being instrumental to its introduction.

Roxburgh also (Flora Indica, vol. 2, p. 43,) makes the following remarks regarding the useful properties of this plant:—

"The leaves of this plant yield Indigo, as mentioned by Mr. Marsden, and by Mr. Blake, in the first volume of the Asiatic Researches. I have also extracted it from them by hot water. The few experiments I have yet made do not enable me to say positively in what proportion they yield their colour; but it was of an excellent quality, and as the plant grows very readily from layers, slips, or cuttings, I think it very well worthy of being cultivated; particularly as it is permanent, like the *Nerium*, so that a plantation once formed, will continue for a number of years; and if we are allowed to draw a comparsion between the leaves of this plant, and those of *Nerium tinctorium*, the quantity of colour they may yield will be in a larger proportion than from the common *Indigo* plant.

"Since writing the above I have learned, that this plant is a native of Cooch-bahar, and had some of the plants sent me from thence, also of Pegu, from whence I have likewise received plants.

"Some more experiments I have made with the leaves, confirm what is above related, not only respecting the quality of the Indigo, but also that the proportion is considerably greater than is obtained from *Indigofera tinctoria*. I have therefore warmly recommended an extensive cultivation thereof."

The plant is also alluded to in Low's Dissertation on Penang and Province Welesley.

* This plant Mr. Griffith recognizes as one of the Indigo-giving Acanthacea, of which little or nothing is known, and he thinks it may be quite new. This genus, he observes, is also found in Assam; it gives a deep indigo, and the Singphos and Kamptees use it largely.

In using the above, the natives content themselves with a deposit from the plant of a thickened dry consistency, so that I am unable to send any specimen of the produce in the cake. I shall endeavour to do so, however, by some future opportunity.

Besides the specimens now sent, there is another kind of indigo plant known to the natives here, which I have not been able to obtain, owing to its being of too tender a nature to bear removal, and it is still some time before it flowers; when this takes place, I will secure some seed, together with seed of the parasite plant, and forward them to you.

I had other subjects to notice by this opportunity, but the approach of the steamer prevents my doing so; you must therefore excuse this crude communication.

Amherst, 18th November, 1844.

Memorandum.*

In submitting the results of my analysis of three specimens of soils from the Tenasserim provinces, it is expedient that I make a few preliminary remarks on the condition of those soils, as they were received by me. The two specimens from Major Macfarquhar's garden at Tavoy, were put up in paper parcels, covered with wax cloth. These appear to me to have lost their water of absorption considerably by evaporation, and hence materially affect a correct analysis of these specimens, so far only, however, as their water of absorption is concerned, and on which, so much of the fertility of the soil depends. The sample from Mr. O'Riley, packed in a box, was in a perfect state of preservation.

The object in forwarding these soils, as stated in Mr. O'Riley's communication, is the probability of their analysis leading to some correct data, as to the cause of the produce of the soils being exempt from the attacks of white ants. Mr. O'Riley observes, " your remarks on the subject of the

* In forwarding this memorandum, Dr. M'Clelland observes, " Mr. Scott has taken very great pains in the analysis, and I fully approve of his remarks."

Otaheite cane in Tirhoot are very interesting. The same amount of produce, or even more on the average per acre of new soils on this coast, may be obtained with the very material point in its favor of *being entirely free from the attacks of white ants,* a subject which appears to oppose very serious obstacles to the extended cultivation of the Otaheite plant in the Upper Provinces." He further adds, "to afford every information in regard to the nature and properties of the soil, the produce of which is exempt from this pest, I have the pleasure of forwarding a box of the soil taken from one of the gardens, which is about the average of all the cultivation in this vicinity."

The analysis of the two specimens from Major Macfarquhar, affords nothing which would induce me to select it, as being peculiarly distasteful to white ants. They are simply good siliceous soils, and contain nothing more than such soils do in general.

400 parts of the soil, marked "from the surface," yielded

Of water of absorption, ...	15
Of loose stones and gravel, principally siliceous,	47
Of undecompounded vegetable fibres, ...	27
Of fine siliceous sand, ...	205
Of minutely divided matter separated by agitation and filtration, and consisting of carbonate of lime, ...	3
Carbonate of magnesia, ...	1
Matter destructible by heat, principally vegetable,	13
Silica, ...	48
Alumina, ...	16
Oxide of iron, ...	4
Soluble matter, principally chloride of sodium and vegetable extract, ...	2
Amount of all the products, ...	381
Loss, ...	19

400 parts marked "from a cubit below the surface," yielded

Of water of absorption, ...	10
Of loose stones and gravel, principally siliceous,	45
Of undecompounded vegetable fibres, ...	15
Of fine siliceous sand, ...	210
Of minutely divided matter separated by agitation and filtration, and consisting of carbonate of magnesia.	2
Carbonate of lime, ...	6
Matter destructible by heat, principally vegetable,	20
Silica, ...	50
Alumina, ...	14
Oxide of iron, ...	5
Soluble matter, principally chloride of sodium and vegetable extract, ...	3
Amount of all the products,...	380
Loss, ...	20

The sample from Mr. O'Riley, is a rich ferruginous soil, highly absorbent and retentive, as will be seen by the loss of its water of absorption, which nearly amounts to 25 per cent. In this soil, I would unhesitatingly point to the large quantity of metallic oxides it contains, as being in my opinion, offensive to insects. It is a fact, I believe known to agriculturists, that the produce of rich ferruginous soils are more or less exempt from them. The subject, however, is both important and interesting, and well worthy of more extended experiments.

400 parts of this soil, yielded

Of water of absorption, ...	98
Of loose stones and gravel, siliceous, ...	8
Of undecompounded vegetable fibres, ...	2
Of fine siliceous sand, ...	190

Of minutely divided matter, separated by agitation and filtration, and consisting of carbonate of lime, ...	10
Matter destructible by heat, (vegetable,) ...	12
Silica, ...	40
Alumina, ...	14
Oxide of iron, ...	12
Oxide of manganese, ...	2
Soluble matter, principally chloride of sodium, and vegetable extract, ...	2
Amount of all the products,..	390
Loss, ...	10

I would suggest that soils collected for analysis, be preserved in bottles, *quite filled with them,* and closed with ground glass stoppers.

J. G. Scott.

Note to Mr. Sconce's *Paper, page* 203.

"This perhaps is stated too generally,—it was my purpose rather to allude to the use of Salt in the preparation of a native's "salun," that is, his too often meagre stew of vegetables or fish skins rather than fish, eaten with his rice; and to the necessity which the dearness of salt imposes upon a poor man of cooking once a day, and saving the remnants for a second meal."

Correspondence and Selections.

FURTHER PARTICULARS CONNECTED WITH THE CULTIVATION OF THE OLIVE, AT THE GOVERNMENT BOTANIC GARDEN AT HEWRA, IN THE DECKAN; WITH NOTICES REGARDING THE GROUND NUT AND CASTOR OILS.

Communicated by Dr. ALEX. GIBSON, *Supt. Govt Botanic Gardens, Bombay Presidency.*

Hewra, Deckan, 11th November, 1834.

I have been duly favoured with your letter, communicating the resolution of the Committee of the Society of Horticulture of India, requesting me to furnish information regarding the locality, &c. of the olive trees now in the garden here.

In reply, I have the pleasure to acquaint you, for the information of the Society,

1st. That this locality is about 2000 feet above the sea level.

2nd. That the distance from the sea in a direct line is about 70 miles.

3d. That owing to the very open country extending from this to the Ghauts, (distant 20 miles,) the sea breeze is sensibly felt, but from the nature of the soil, the bareness of the country, &c., the quantity of moisture which it adds to the otherwise very dry air is, until early in May, hardly appreciable.

4th. The mean of annual temperature may be stated as about 76° Fah. Extremes from 103° to 50° Fah. The former temperature is rare, 92° to 94° being most generally the daily highest rise in the hot season, so that the climate is comparatively temperate.

As to the present state of the olive trees in the garden here, they do not appear to be at all affected by the heat; and as to wood and leaves, are most flourishing. Height may be about 14 feet, but though I have now had them for $3\frac{1}{2}$ years in the garden,

they have not yet flowered, though they have been coaxed by ringing, tying the branches, &c.

The numerous side shoots afford stout walking sticks. They are evergreen. From the very succulent and healthy state of the main trunks, I have every hope that they may yet flower.

I think that the tree might have a good chance of success in sheltered valleys of the table land towards the head of the Taptee and Nerbudda rivers, in the vicinity of jungle, so as to afford a climate somewhat *moist*. I do not think that the heavy rains of Bengal, Assam, or of the Tenasserim provinces would suit the tree. I also believe, that the climate of the Agra provinces would, like that of Guzerat, be found too dry and hot in the hot season. Probably the climate of Malwa might suit it better than any.

I will have much pleasure in doing my best to give effect to any resolutions the Society may make as to the further extension of the tree.

13th November.—I am very glad to see, that the subject of oils is so actively taken up by your Society.

From what I see of the ground nut oil, (at least that expressed by Bramah's press,) it, as a table oil, is much superior to the olive oil as commonly met with in this country; but that expressed by the common process, has generally an admixture of other oils. This year I have supplied the medical stores, and will probably continue to do so.

The castor oil obtained by the same process differs from the clearest castor oil of the bazars in being quite free from taste. This also, it is likely, I may supply to the stores in future; and, on the whole, I am of opinion, that this oil-press produces oils which will be sought after in the market, when the manufacture shall be conducted on a more extensive scale.

Bearing pillars are however essential to the efficiency of the machine, particularly in pressing those oils which contain much stearine. The plates ought to fit into the bearing pillars, which should be of strong square iron, and rise through holes in the roof of the press.

I will be happy at any time to communicate to the Society any further particulars.

FURTHER INFORMATION REGARDING THE WHITE LINSEED AND WHEATS OF CENTRAL INDIA.

Extract of a Letter from Lieutenant Colonel J. R. OUSELEY, *A. G. G: S. W. Frontier, dated Chota Nagpoor,* 16*th November*, 1844.

With reference to your letter of the 16th September 1844, regarding white linseed and wheats, I have the pleasure to forward a price current for several years, furnished by the Deputy Commissioner, Captain Spence, who obligingly had it made out for me.

I can only add, that the linseed is sowed at the same time with wheat.

You sow one bushel of linseed in land that would require four bushels of wheat seed; one bushel sowed, should give a return of twenty-four fold to thirty-two fold.

The price current shews best the estimation in which white linseed is held, also the relative value of wheats. Jalalya and Sohaiya are synonymous. Ulsee is linseed.

I am convinced that Jalalya wheat would be most prized in England, and if possible, I shall send a small quantity, via Bombay, for the opinions of professional men at home. White linseed is exported towards Bombay, and is to be found at Jubbulpore; but I understand none grows north of Rewah; and from inhabitants of Oude now here, I am informed it is unknown in that territory; it forms an article of trade south of the Nerbudda, and is in great demand.

Price Current per manee of* 24 *rooroos of Gram, Pergunnah Hoshungabad.*

	WHEAT.			ULSEE.			
	Julalya.	Sohalya.	Kutya.	Pissee.	White.	Black or Red.	Tig.
	Nag. Rs. As. P.	Nag. Rs. As. P.	Nag. Rs. As. P.	Nag. Rs. As. P.	Nag. Rs. As. P.	Nag. Rs. As. P	Nag. Rs. As. P.
Month of March 1835.	6 2 0	6 2 0	6 0 0	5 0 0	6 0 0	5 0 0	5 0 0
1838,	5 8 0	5 8 0	5 0 0	4 0 0	5 0 0	4 0 0	5 0 0
1841,	4 8 0	4 8 0	1 0 0	4 0 0	4 12 0	4 0 0	4 0 0
1844,	3 0 0	3 0 0	2 8 0	2 0 0	5 0 0	4 0 0	4 0 0

(True Copy,)
J. R. OUSELEY,
Agent Govr. Genl. and Commisioner.

(Signed) H. SPENCE,
Deputy Commissioner, 1st Class.

Hoshungabad, Deputy Commissioner's Office, the 29th October, 1844.

* 8 paillees make one rooroo, which is equal to 90 tolas weight; therefore a manee weighs about 5 maunds and 16 seers, allowing 40 seers to the maund, and 80 tolas to the seer.

ON THE MODE OF CULTIVATING THE LATAKIA TOBACCO.

Extract of a letter from Dr. ALEXANDER GIBSON, *dated Hewra, 13th November*, 1844.

"I beg to apologize for not having sent the accompanying Remarks on the Latakia tobacco before now. The season for sowing is now over, and I will therefore not send any more seed this year."

The seed is sown with us (at Latakia) in March in ground free from stones, and well manured with goat's-dung, and strewn over with prickly bushes to protect the young plants from birds. Water daily till the plants reach the size of 8 or 10 inches, then transplant.

In July the tobacco is gathered, and made into small bundles which are exposed in the sun for some days, and are then hung up in the peasant's huts, and left hanging all the winter for their being fumigated, and thus acquiring the peculiar flavour.

All tobacco cultivated about the Latakia mountains derives its origin from the same seed; but the difference which exists between the qualities of the "*Abouri-tree*" and the other, is owing to the former being cultivated about high mountains, and to its being fumigated with "*gozen*"* and "*sindian*;"† but those fumigated with *gozen* have the best smell.

The fumigation is not resorted to expressly for the tobacco, but owing to our mountaineers in general being obliged to burn much wood in the winter in their huts, which answers both purposes. The smoke improves the tobacco both in colour, smell, and flavour. The other qualities not being fumigated, are yellowish instead of brown, and have never the agreeable smell, &c. of the "*Abouri tree.*"

(Signed) M. LYONS.

(True Copy,) ALEXANDER GIBSON,
Supt. Botanic Garden.

REPORT ON THE STATE OF THE AGRICULTURAL AND HORTICULTURAL SOCIETY AT LUCKNOW.

Extract of a letter from Captain G. E. HOLLINGS, *dated Lucknow, 31st December*, 1844.

"I have the pleasure to forward an account of a Meeting of the Members of our Horticultural Society, which took place on the 30th instant, and it affords me very great satisfaction to attract your

* Pine wood, which abounds in Syria. † Probably oak.

notice to the 2nd Resolution, and to request, that you will convey to the Society generally, and accept yourself, the best thanks of the Lucknow Agricultural and Horticultural Society, for the kindness and readiness with which all my applications have been complied with."

At a general Meeting of the Subscribers to the Horticultural and Agricultural Society at Lucknow, held at the Banquetting Rooms of the Residency, on Monday the 30th December, 1844.

Present, MAJOR WILCOX,
The REV. MR. CARSHORE,
" CAPTAIN HOLLINGS,
" CAPTAIN FRASER, and
" DR. J. S. LOGIN.
MAJOR WILCOX in the chair

The Secretary having submitted his report of what had been done in the Society's Garden, from the time of his having taken charge of it, and also exhibited a statement of the accounts to the end of the year 1844, shewing a balance in cash of 1,500 : 9 : 11, out of which the current expences of the present month 229 : 9 : 9½, are to be paid, and the sum of Sicca Rs. 2,500 in Government Securities, *it was resolved unanimously*, that as the report is highly satisfactory and the accounts correct, the thanks of the Meeting be offered to the Secretary, Captain George E. Hollings, for his most zealous and unremitting attention to the interests of the Society, and that he be requested to continue his able and efficient services in his present office.

2dly.—It was also resolved, that the recommendation of the Secretary in the last para. of his report be most cordially adopted, and the thanks of the Meeting be conveyed to the President and Members of the Agricultural and Horticultural Society in Calcutta, and to James Hume, Esq. their Secretary.

3dly.—Resolved, that the Secretary's recommendation regarding additional wells, &c., be likewise adopted.

4thly.—It being in the opinion of the Members conducive to the objects of the Society, that periodical exhibitions of fruits and vegetables be held, and prizes be distributed for the best specimens, it *was resolved* that an annual sum of Rupees 120 be appropriated from the funds of the Society for the same, and that the Secretary

be requested to invite Subscribers in aid of this object. The time of holding the exhibition to be determined by the Secretary, who will give twenty days' previous notice of the same, in order that native gardeners in the city and cantonments may be duly aware of it.

5thly.—That a supply of English flower and vegetable seeds be annually ordered from England, in order that a succession of vegetable crops may be secured; the amount for the purchase and transmission of the same to be for the present limited to £15 per annum.

R. WILCOX, *Chairman.*

On Major Wilcox leaving the chair, it was unanimously voted, that the thanks of the Meeting be given to the Chairman.

G. E. HOLLINGS, *Secretary.*

Report regarding the state of the Agricultural and Horticultural Society at Lucknow, submitted to a General Meeting of the Members, assembled on the 30th December, 1844.

As I have had charge of the Public Garden at Lucknow for nearly two years and a half, it is necessary that I should submit for your consideration, as full a report as I can prepare of all that has been done during that period, and the practical result which is shewn in the accounts now submitted for your approval. You are well aware, that at the time I accepted the office of Secretary, a large portion of the funds so liberally given by His Majesty the King of Oude, and subscribed by Colonel Low, C. B. then Resident, and the original contributors, had been expended in laying out the grounds, and in useful experiments; and I found the sum of three thousand Rs. in Government Securit

month from His Ma

the sale of which from the local demand would be profitable, and I laid out the gains in renewing the stock. The accounts submitted with this report will show, how many young bullocks have been purchased to replace old and unserviceable ones; what new carts have been bought; what old ones repaired; what implements of agriculture have been renewed. The Darogah's house and corresponding one for the accommodation of occasional visitors have been thoroughly repaired; many out-offices, which were indispensably necessary, built, and others, as well as the bullock-sheds, re-roofed; the extensive wall round the garden, and the different wells have been always kept in repair, and several new puckah drains for the conveyance of water constructed.

By a prudent foresight in laying in supplies of grain and bhoosah, the cattle have been fed at a much less expence than formerly; whilst the rate received for every article of produce, has far exceeded what could possibly have been contemplated.

If I had intended to claim any credit to myself from the improved condition of the garden, I would have refrained from attracting your attention to the details of what has been done, and have contented myself with allowing the accounts to be my vouchers; but I consider it an act of justice to give the credit where it is due; viz. to the native Darogah who by always attending to the orders he has received, and devoting the energies of an honest and intelligent mind to the performance of his duties; by giving me the advantage of his experience in all matters connected with the purchase of materials; the proper periods for laying supplies of grain &c.; the most fitting opportunities for buying cattle, &c.; and by his active and untiring exertions as a superintendent, has been the real cause of the great improvement in the prospects of the garden.

If we may judge from what has occurred, we have only made a good commencement; the cold ingratitude of the soil has been overcome by a generous application of manure, and by agricultural industry; there is no reason to suppose, that even any great progress has been made, on the contrary we may fairly conclude, that by a continuance of the system that has now been established, the resources of the garden will yearly increase, and that with an im-ed knowledge of agriculture gained by experience, we shall ally be able fully to carry out the object for the attainment

of which the garden was originally established; namely, the dissemination throughout Oude of the most valuable seeds of every kind of produce, and the communication of the manner in which they can be best and most profitably cultivated. It will be seen that during last year, I was obliged to reduce the permanent funds by the sale of five hundred Rupees of the Government paper belonging to the garden; the surplus in hand will admit of that sum being repaid, and I have no fear of being again obliged to indent on the capital. To meet a temporary emergency, I thought it expedient to sell some of the valuable graft mangoe trees of three and four years of age, the value of which has been redeemed by the number of grafts taken during the last two years; the establishment of nurseries for seedling fruit trees of every description; the value of the vines from seed brought by Sir Wm. Nott from Cabool, and from the grapes sold in boxes; and the numerous grafts from guava, orange, and other trees now in the garden. A considerable quantity of good arable ground has been recovered by the sale and cutting down of country mangoe trees which, as regards our objects, were neither ornamental nor useful. The surplus profits have enabled me to pay some attention to floriculture, and I feel convinced, that the introduction of the cultivation of English, American, and Cape flowers must be agreeable to you. I venture to recommend to your attention, or rather solicit your sanction to the expenditure of money sufficient to dig two or three new wells, and the payment of the extra number of bullocks and establishment to ensure their being efficiently worked, under a full conviction, that eventually the increased produce will more than indemnify us for the present expence.

The accounts submitted to you so fully explain the result of what has been done during the time that I have had charge of the garden, that I consider it unnecessary to offer any comments on them; but I cannot conclude this report without asking you to join me in thanking the Agricultural and Horticultural Society in Calcutta, and their able and most obliging Secretary, for the kindness and readiness with which all my applications have been complied with; which I am sure you will do most readily, when you hear, that all the best vegetables at present growing in the garden, have been produced from seeds sent from Calcutta.

G. E. Hollings, *Secretary.*

Statement shewing the Receipts and Expenditure of the Horticultural Society's Garden at Lucknow, from 20th December 1840 *to* 31*st December* 1843.

Months.	1841. Amount received from the Treasury.			Amount received for sale of the productions.			Amount received from the cultivators.			Total.			Amount expended.			Remarks.
From 20th December, 1840 to January, 1841, ...	0	0	0	148	7	10	128	0	0	276	7	10	*399	5	4	* Including two months' pay of servants.
February, ...	200	0	0	28	11	0	96	0	0	324	11	0	214	3	6	
March, ...	0	0	0	9	9	0	54	8	0	61	1	0	191	1	0	
April, ...	200	0	0	16	4	9	51	14	9	268	3	6	241	7	6	
May, ...	200	0	0	135	4	3	42	14	3	378	2	6	214	9	3	
June, ...	0	0	0	316	13	3	20	15	0	337	12	3	270	1	9	
July, ...	0	0	0	22	2	9	1	0	0	23	2	9	162	9	9	
August, ...	200	0	0	20	0	9½	0	0	0	220	0	9½	159	12	6	
September, ...	200	0	0	34	1	2½	0	0	0	234	1	2½	157	14	3	
October, ...	0	0	0	33	7	0	42	0	0	75	7	0	324	13	1	
November, ...	200	0	0	59	4	3	0	0	0	259	4	3	172	14	6	
December, ...	200	0	0	43	8	9	0	0	0	243	8	9	206	11	6	
Total, Rs.	1,400	0	0	867	10	10	437	4	0	2,704	14	10	2,715	10	11	

G. E. Hollings, *Secretary.*

Statement shewing the Receipts and Expenditure of the Horticultural Society's Garden at Lucknow, from 20th December 1840 to 31st December 1843.—(Continued.)

Months.	1842. Amount received from the Treasury.	Amount received for sale of the productions.	Amount received from the cultivators.	Total.	Amount expended.	Remarks.
January, ...	0 0 0	27 14 3	50 0 0	77 14 3	190 2 0½	
February, ...	200 0 0	0 7 6	0 0 0	200 7 6	194 14 0	
March, ...	200 0 0	4 0 0	46 0 0	250 0 0	200 3 3	
April, ...	200 0 0	129 10 3	0 0 0	329 10 3	310 5 6	
May, ...	0 0 0	80 8 0	47 0 0	127 8 0	184 12 0	
June, ...	200 0 0	12 0 0	0 0 0	212 0 0	177 10 6	
July, ...	200 0 0	266 0 0	0 0 0	466 0 0	239 12 0	
August, ...	0 0 0	18 5 3	0 0 0	18 5 3	177 0 6	
September, ...	200 0 0	60 11 3	0 0 0	260 11 3	321 2 9	
October, ...	0 0 0	134 14 6	0 0 0	134 14 6	247 13 10	
November, ...	200 0 0	61 15 0	70 0 0	331 15 0	511 14 1	
December, ...	400 0 0	32 5 10	6 0 0	438 5 10	274 3 0½	
Total, Rs.	1,800 0 0	828 11 10	219 0 0	2,847 11 10	3,029 13 6	

G. E. Hollings, *Secretary.*

Statement shewing the Receipts and Expenditure of the Horticultural Society's Garden at Lucknow, from 20th December 1840 to 31st December 1843.—(Continued.)

Months.	1843. Amount received from the Treasury.	Amount received for sale of the productions.	Amount received from the cultivators.	Total.	Amount expended.	Remarks.
January, ...	300 0 0	40 12 0	72 0 0	412 12 0	349 1 4	
February, ...	250 0 0	21 9 0	7 0 0	278 9 0	341 7 8½	
March, ...	191 15 0	57 12 6	101 0 0	350 11 6	349 12 6	
April, ...	190 5 9½	196 12 2	85 8 0	472 9 11½	339 1 7	
May, ...	316 13 5	121 14 3	0 0 0	438 11 8	422 9 8	
June, ...	40 11 5	158 3 9	100 0 0	298 15 2	655 12 2½	
July, ...	350 0 0	374 5 6	0 0 0	724 5 6	282 0 4	
August, ...	0 0 0	270 8 9	100 0 0	370 8 9	222 9 10	
September, ...	0 0 0	3 3 6	24 12 0	27 15 6	249 14 9	
October, ...	200 0 0	101 4 0	0 0 0	301 4 0	352 11 2	
November, ...	0 0 0	37 1 9	0 0 0	37 1 9	274 11 9	In 1843 there
December, ...	300 0 0	48 7 6	0 0 0	348 7 6	393 15 3	were about 600 Rs. received for Bom-
Total, Rs.......	2,139 13 7½	1,431 14 8	490 4 0	4,062 0 3½	4,233 12 1	bay mangoe grafts.

G. E. Hollings, *Secretary.*

Statement Sewing the receipts and Expenditure of the Horticultural Society's Garden at Lucknow from 20th December 1840 *to* 31*st December* 1843.—*(continued.)*

Months.	1844.					Remarks.
	Amount received from the Treasury.	Amount received for sale of the productions.	Amount received from the cultivators.	Total.	Amount expended.	
January, ...	200 0 0	53 1 4	0 0 0	253 1 4	270 5 6	
February, ...	0 0 0	111 7 6	74 0 0	185 7 6	326 11 0	
March, ...	500 0 0	166 6 0	0 0 0	666 6 0	334 8 10	
April, ...	190 7 1½	274 6 2	32 9 0	497 6 3½	445 9 8	
May, ...	198 0 10½	336 10 11	68 11 0	603 6 9½	397 0 4	
June, ...	196 0 0	409 4 4	0 0 0	605 4 4	565 4 10½	
July, ...	0 0 0	50 7 3	0 0 0	50 7 3	304 10 6½	
August, ...	200 0 0	*301 7 9	0 0 0	501 7 9	245 14 10½	* Including price of country mangoe trees sold.
September, ...	61 14 10	†220 4 4½	0 6 0	[illegible]82 3 2½	378 8 4	† Ditto ditto.
October, ...	0 0 0	273 10 7½	0 0 0	273 10 7½	308 13 10½	
November, ...	0 0 0	151 15 9	100 0 0	251 15 9	289 14 11	
December, ...	0 0 0	233 14 6	0 0 0	233 14 6	403 1 9	
Total, Rs.......	1,546 6 10	2,583 0 6	275 4 0	4,404 11 4	4,270 8 7	

G. E. Hollings, *Secretary*.

Abstract.

	1841.			1842.			1843.			1844.		
Drawn from the Treasury, ...	1,400	0	0	1,800	0	0	2,139	13	$7\frac{1}{2}$	1,546	6	10
Sale of Produce, ...	867	10	10	828	11	10	1,431	14	8	2,583	0	6
Amount received from Cultivators, ...	437	4	0	219	0	0	490	4	0	275	4	0
Total, ...	2,704	14	10	2,847	11	10	4,062	0	$3\frac{1}{2}$	4,404	11	4
Amount Expended, ...	2,715	10	11	3,029	13	6	4,233	12	1	4,270	8	7
Average Monthly sale of Products, ...	72	4	$10\frac{3}{4}$	69	0	$11\frac{3}{4}$	119	5	$2\frac{1}{2}$	215	4	$0\frac{1}{2}$
Average Monthly expences, ...	226	4	11	252	7	$9\frac{1}{2}$	352	13	0	355	13	$4\frac{1}{2}$

Purchase of cattle, buildings, repairs of wells, walls, &c. &c. are included under the head sundry expences.

Sundry expences,	1842,——	239	13	9
,,	1843,——	714	7	4
,,	1844,——	531	6	6
	Total,...	1,485	11	7

G. E. Hollings, *Secretary.*

ESTABLISHMENT OF AN HORTICULTURAL SOCIETY AT SIMLA.

James Hume, Esq., *Honorary Secretary, Agri-Horticultural Society.*

My dear Sir,—I have very great pleasure in forwarding the Proceedings of the new Horticultural Society of Simla.

From a communication with Dr. MacGregor of Sabathoo, who has been remarkable for his success in raising a great number of

the choicest flowers from seeds received Overland, I entertain the hope, that another Horticultural Society will be established there, in connection with that of Simla. Sabathoo is not near so elevated, the temperature 10 degrees less, and the rains not so heavy as they are here, consequently there are many kinds of flower and fruit plants which will succeed at Sabathoo, which could not be reared at the great elevation of Simla.

Believe me, &c.

FREDERICK CORBYN.

Simla, Dec. 11, 1844.

Proceedings of a Meeting convened at Simla on the 30*th September,* 1844, *for the purpose of considering the propriety of establishing a Horticultural Society and Gardens at the Station.*

The Honorable J. C. ERSKINE, Sub-Commissioner, in the chair.

RESOLVED.

1st.—That the rapidly increasing demand for fruits and vegetables at Simla being evident, and the inferior quality of those grown in the neighbourhood and bought at the bazars, much and justly complained of, it be deemed expedient at this meeting that measures should be taken to increase the supply, and improve the quality of those necessary articles of consumption.

2d.—That to attain these ends, the formation of a Horticultural Society, supported by voluntary subscription, is desirable; and that it be attempted to form one. For this purpose those, whose names are attached hereto, agree to become Members and supporters of the said Society.

3d.—That it be determined, that the first objects of the Society be those which are likely to be of the greatest utility, and therefore that its earliest efforts be directed to the formation of a nursery; this *nursery* to be principally devoted to the raising of fruit trees and vegetable seeds for distribution; first among the Subscribers; and secondly among those native gardeners and cultivators who may be most likely to supply the station bazars with their produce.

4th.—That for the purpose of immediately testing the prospect there is of improving in the climate of Simla the vegetables most

in demand, a piece of the Nursery ground be set aside as a Kitchen garden during the ensuing year. The produce of the kitchen garden to be sent to the centre bazar of the station, and sold for the benefit of the Society's Funds.

5th.—That as the culture of flowers constitutes a pursuit equally harmless and attractive, and one as well suited to amuse and occupy the invalid as to engage the attention of the healthy and more active, the next object of the Society shall be the formation of one or more flower gardens, on condition that the Funds prove sufficient for the purpose after the expenses of the nursery and kitchen garden have been provided for.

6th.—That the affairs of the Society be managed by a Committee, chosen from among the permanent residents and annual visitors of the station, to be elected half-yearly, on or about the 15th days of April and September of each year.

7th.—That to give the proposed Society a present substantial existence, a Committee of Management be now chosen, and granted full power to receive subscriptions, to select and either purchase or hire on lease, as may be most expedient and practicable, a piece of ground in some suitable situation, to entertain an establishment, and to purchase tools, seeds, or whatever else they may consider necessary for the proper construction of the proposed nursery and garden, being guided in their proceedings by the amount of funds which may be contributed, and the present and prospective demands upon them.

8th.—That the below named gentlemen be requested to take upon themselves the duties of the first Managing Committee, and for the purpose of obviating any inconvenience that might attend a return to the plains or occasional absence of any of the members, that they be allowed to add to their number whenever they may consider such a measure likely to promote the efficiency of their operations.

9th.—That the Committee be requested to put themselves in communication with the *Agri-Horticultural Society of Calcutta*, and solicit permission to consider the *Simla Horticultural Society* as an auxiliary branch of that institution.

10th.—That the Committee be requested to address the non-resident possessors of Simla property, and ask their assistance in promoting the interests of the Society, &c. &c.

Members of the Committee.

The Honorable John C. Erskine,
Major General T. P. Smith,
Colonel Chadwick,
F. Corbyn, Esq.
B. Hodgson, Esq.
Major Boileau,
—— Farrington,
—— T. Scott,
Robt. Hay, Esq.
—— Carte, Esq.
H. T. Tapp, Esq.

(Signed) John C. Erskine,
Chairman.

CULTURE OF FOREIGN COTTON, AND OTHER PRODUCTS AT RUNGPORE.

Extract of a letter from H. Rehling, *Esq., dated Bhetgarra, 24th October,* 1844.

"I have now the pleasure to inform you, that I have by to-day's dâk bangy forwarded to your address, a small parcel, containing cotton,* raised from the acclimated New Orleans seed you kindly

* These musters, the produce of New Orleans seed, acclimated at the Government farm at Coimbatore, is thus reported on by a Member of the Committee :—

"The Cotton is a fair specimen of the acclimated seed cotton. It is soft, tolerably strong and of fair colour, but the staple or fibre appears to me not of so good a length as we witness usually in this description grown in Lower Bengal. It is somewhat curled or wiry: these defects arise probably from a want of sufficient care or attention in the cultivation, and which could be remedied. The cotton too has been planted at the wrong season which, in Bengal, I think should be during August and September, not later, so as to be enabled to gather in the dry months, when there will be less chance of the bowls being injured by the red worm, and of the wool being discolored."

supplied me with. It is the first cotton I have picked, and as the color might be objected to, I beg to remark that the cotton has been picked after very bad weather; when an opportunity offers I shall do myself the pleasure to send you another sample, in a larger quantity, and I hope of a better quality too. Knowing nothing of cotton, I can of course not form any opinion as to the quality of the cotton, but to judge from the plants I have now on the ground, I should say, this district is remarkably well adapted to the culture of this important staple. Some of the plants on the high lands are literally groaning under the weight of the bowls, which I am sorry to say are subject to the puncture of worms, which circumstance either causes the bowls to fall off, or the cotton is injured in color and quality. It is to be regretted, that no public spirit has been evinced by European residents for agricultural improvements in this district, for which purpose it is by nature so highly gifted for I consider Rungpore, one of the richest and best cultivated districts in Bengal; the soil retains its moisture the whole year round, the months of March and April excepted, when they are generally relieved by refreshing showers; sugar-canes, tobacco, oil seeds, wheat and other grains, ginger and turmeric, and mulberry plants for silk worms, are articles which are extensively cultivated in this district, and that without irrigation, the process of which is entirely unknown to ryots here, who otherwise pay a great deal of attention to their cultivation, and the only thing that is requisite is to introduce an improved mode of cultivation amongst them, and to supply them with superior seeds. I propose to devote my humble efforts for the above purpose, and crave the aid of the Society in supplying me with seeds and plants of useful productions. I have secured about 40 biggahs of land in the neighbourhood of this place, which I intend to turn into a nursery garden for useful products, and I will particularly turn my attention to the introduction of the superior specimens of sugar-canes, foreign cotton, grains, and all kinds of useful tubers."

MODE OF RAISING LAVENDER FROM SEED.

Extract of a letter from F. NICOL, *Esq., dated Chandpore, Jessore, 11th December,* 1844.

"Your note of the 23d ultimo, with a small packet of Lavender seed, I have to acknowledge with thanks. I have managed to get the Lavender to germinate this year. My plan is, to place a piece of blanket over the seed, which I sowed in rich ground filled into a gumlah, which I set in the sun, and throw water on the blanket morning and evening; this has succeeded;—it remains however to be seen, whether I shall be able to rear the plant.

The Cape seeds received from the Society have all proved good this year, not a single failure.* The great pity is, that they did not arrive sooner, as I fear the hot weather will set in before the vegetables can arrive to perfection."

ON THE CONVEYANCE OF PLANTS AND SEEDS ON SHIP-BOARD.

(From a lately published work on the growth of plants in glazed cases. By N. B. WARD, F. L. S.)

Numerous have been the methods employed in the conveyance of plants to and from distant countries. It is quite unnecessary, however, to enter into any lengthened account of these attempts, as they resolve themselves into two kinds;—the one where the plants are meant to be kept in a passive condition; and the other where means are employed to keep them growing during the voyage.

The best method of keeping plants in a state of rest is the one generally employed, and, I believe, first recommended by Messrs. Loddiges, viz.—the packing them in successive layers of bog-moss *(Sphagnum)*, which answers very well for the majority of deciduous trees and shrubs and other plants, when dispatched at the termination of their active season. For the package of Cactuses and other succulent plants, Messrs. Loddiges recommend the driest sand, all vegetable matters being injurious.

But by far the greater number of plants require to be kept growing during the voyage; and prior to the introduction of the glazed cases, a large majority of these plants perished from the variations of tempera-

* Several other communications regarding the goodness of the Cape seeds have reached the Society.

ture to which they were subjected,—from being too much or too little watered,—from the spray of the sea,—or, when protected from this spray, from the exclusion of light. The venerable Menzies informed me that, on his return from his last voyage round the world with Vancouver, he lost the whole of his plants from this latter cause. Again, if the voyage lasts longer than usual and the water runs short, it is not every one who has the care of plants that will imitate the example of the patriotic M. de Clieux, who, in 1717, took charge of several plants of coffee that were sent to Martinico, and approved himself worthy of the trust. The voyage being long and the weather unfavourable, they all died but one; and the whole ship's company being at length reduced to short allowance of water, this zealous patriot divided his own share between himself and the plant committed to his care, and happily succeeded in carrying it safe to Martinico, where it flourished, and was the parent stock whence the neighbouring islands were supplied.

When I reflected upon the above causes of failure, it was obvious that my new method offered a ready means of obviating all these difficulties, so far at least as regarded ferns, and plants growing in similar situations; and in the beginning of June, 1833, I filled two cases with ferns, grasses, &c., and sent them to Sydney under the care of my zealous friend Capt. Mallard, whose reports on their arrival will be found in the Appendix.*

The cases were refilled at Sydney in the month of February, 1834, the thermometer then being between 90° and 100°. In their passage to England they encountered very varying temperatures. The thermometer fell to 20° in rounding Cape Horn, and the decks were covered a foot deep with snow. At Rio Janeiro the thermometer rose to 100°, and in crossing the line to 120°. In the month of November, eight months after their departure, they arrived in the British Channel, the thermometer then being as low as 40°. These plants were placed upon the deck during the whole voyage and were not once watered, yet on their arrival at docks they were in the most healthy and vigorous condition; and I shall not readily forget the delight expressed by Mr. George Loddiges, who accompanied me on board, at the beautiful appearance of the fronds of *Gleichenia microphylla*, a plant never before introduced alive into this country. Several plants of *Callicoma serrata* had sprung up from seed during the voyage, and were in a very healthy state.

* These reports, as also some other interesting correspondence "on the growth of plants without open exposure to air," are published in the Transactions of the Agricultural and Horticultural Society of India, vol. 4.—Eds.

My next experiment was with plants of a higher order. Ibrahim Pacha, being desirous of procuring useful and ornamental plants for his garden near Cairo, and at Damascus, I was requested by his agents to select them, and they were sent out in August, 1834, in the Nile steamer, to Alexandria. They arrived quite healthy after a passage of two months.* On a subsequent occasion a case-full of coffee plants was dispatched with the like successful result. It is needless to particularize any more instances, as Messrs. Loddiges† have sent out more than four hundred cases to all parts of the world, with uniform success when the proper conditions were observed; and I believe that the plan, where known, is universally adopted. The French and the English Governments have moreover ordered these cases to be used in their expeditions of discovery; and there are few, I imagine, who will now imitate the ill-timed economy of Mons. Guillemin, who was sent by the Minister of Agriculture and Commerce at Paris, to Brazil, for the purpose of obtaining information respecting the culture and preparation of the tea-plant, and the introduction of this shrub into France. Mons. G. had personal knowledge of the efficacy of the closed plan, having carried out Camellias to Rio in one of my cases; and he says that his first plan had been to construct boxes on Mr. Ward's system, but the heavy price‡ deterred him; while the safety with which he had brought his fruit-trees§ from Europe, in a box with sliding panels, induced him to fix finally on this latter mode of construction.

The results I will give in his own words.—"Very pleasing was the sight to me, when, the day after the Heroine had sailed, (May the 20th, 1839), I beheld my eighteen precious boxes arranged two and two in such a situation as kept them steady and level, permitted them to receive light, and to have the moveable panels closed in bad weather. The vigour of my tea-plants, and the lovely verdure of their foliage, had been generally admired at Rio, and I fondly anticipated the most prosperous results from my expedition. But short-lived was this satisfaction. Two days after heavy north winds drove us off our course, the sea became more boisterous than is usual in these latitudes, and the necessity for closing the ports, lest the spray should irrevocably ruin my plants, caused them a great injury by the necessary exclusion of light. To the latter circumstance I attribute the first deterioration of

* Vide Appendix, D. † Vide Appendix, G.

‡ The cost of glazing the whole of Mons. G.'s cases would not have exceeded £20.

§ Had Mons. G. reflected for one moment upon the different states of the fruit trees and of the tea-plants,—the former being conveyed at the close, and the latter at the commencement of their active season,—he would not, I think, have acted so unwisely.

my plants, especially those more recently set. When the sea became calmer, and permitted us to open the portholes, the wind sweeping the surface of the waves cast a fine salt-water spray upon my boxes, which doubtless proved highly injurious, since the contents of those chests that were exposed to the wind suffered much more than those of the other side. By the 11th of June most of the teas had lost their foliage, and the stalks even of several had quite dried up. Some of the seeds had germinated; the young shoots were slender, long, blanched, and furnished with a few pale leaves. By the 2nd of July, in latitudes 24° north and longitude 42° west, the strongest shrubs were suffering most severely, while some had sent out suckers, and the young seedlings had assumed a greener tint. Capt. Cecille took great interest in the safety of my protégés, and, while the leakage of some of the water-casks had compelled him to put the whole ship's crew on a slender allowance of water, he ordered me an increased quantity for the benefit of the tea-shrubs. The vessel arrived at Brest on the 24th of July, only two months after their departure from Rio, and the shrubs reached Paris in the latter end of August, reduced to 1500 in number, about one-third of the original stock, including young seedlings."* This narrative requires no comment. I believe that not one of the plants would have perished in so short a voyage, had they been protected by glass.

Although all persons interested in this matter are pretty well acquainted with the cases in which plants are usually sent on voyages, it may not be amiss to say a word or two respecting them. In preparing them for the voyage some little attention is requisite. The objects to be attained are, to admit light freely to all parts of the growing plant, and to make them sufficiently tight to retain the moisture within and to exclude the salt water from without. To effect the latter purpose the glazed frames should be well painted and puttied some time before they are required for use. The lower part of the case, which contains the mould, need not be more than 6 or 8 inches in depth; and the plants succeed better if planted in the soil, than in separate small boxes, as in the former case the moisture is more uniformly diffused. The soil should be that in which the plants ordinarily grow, and especial care should be taken that all superfluous moisture should be drained off, as luxuriance of growth is not to be desired. Another point worthy of great attention is to associate plants of equal or nearly equal rapidity of growth. Thus Palms and coniferous plants will travel well together. In a case which arrived at Loddiges, three or four

* I am indebted for this account to Hooker's 'Journal of Botany.'

found, to his great satisfaction, that they all grew extremely well. It is well known to our seedsmen that, even here at home, seeds kept in close warehouses and laid up in heaps frequently spoil, unless they are often sifted and exposed to the air. Seeds saved in moist cold summers, as their juices are too watery, and the substance of their kernels not sufficiently hardened to due ripeness, are by no means fit for exportation to warmer climates.'

"Our acorns, unless ripened by a warm summer, will not keep long in England: those acorns which are brought from America, and arrive early in the year, generally come in good order, owing to their juices being better concocted by the heat of their summer; and are not apt to shrivel, when exposed to the sun, as ours are.

"These hints are given to show how necessary it is to take care that the seeds we send should be perfectly ripe and dry."*

(D.)

Copy of a Letter from Mr. Traill, *to the Author.*

Cairo, April 30, 1835.

Sir,—I beg to acknowledge the receipt of your letter of the 2nd ult., wherein you request information as to the state of the plants sent by you in the Nile steamer.† The collection consisted, I believe, of 173 species, contained in six glazed cases, two of which only were forwarded to me from Alexandria. The one which you mention as having been fitted up with talc, together with three others, were sent on to Syria‡ immediately on their arrival in Alexandria, so that I had no opportunity of seeing them. I have, however, the pleasure to inform you that the Egyptian portion of the collection was received here in the very best condition: the plants, when removed from the cases, did not appear to have suffered in the slightest degree; they were in a perfectly fresh and vigorous state, and, in fact, hardly a leaf had been lost during their passage. Your plan, I think decidedly a good one, and ought to be made generally known.

I am, Sir, &c. &c.

J. Traill.

To N. B. Ward, Esq.

* 'Directions for Captains of Ships, Sea-Surgeons, and other curious persons who collect Seeds and Plants in distant countries, in what manner to preserve them fit for vegetation.'—*John Ellis, London*, 1770.

† In August 1834.

‡ These cases were seen by Col. Higgins of the Engineers, in the garden of the Seraglio, at Beyrout, at the late evacuation of that place by the Egyptians.

List of Plants contained in the two cases sent to Egypt.

Achras Sapota.
Adenoropium panduræfolium.
Aleurites moluccana.
Alphinia nutans.
Anona Cherimolia.
Arenga saccharifera.
Bignonia venusta.
Bombax Gossypium.
Brexia spinosa.
Calathea zebrina.
Caryota urens.
Cedrela odorata.
Cinnamomum aromaticum.
Cinnamomum zeylanicum.
Combretum comosum.
Croton variegatum.
Curcuma longa.
Cycas revoluta.
Dalbergia scandens.
Diospyros cordifolia.
Diospyros edulis.
Diospyros Embryopteris.
Doryanthes excelsa.
Dracæna edulis.
Dracæna ferrea.
Erythrina crista-galli.
Eugenia Pimenta.
Euphoria Litchi.
Ficus elastica.
Flacourtia cataphracta.
Franciscea uniflora.
Jonesia pinnata.
Ixora coccinea.
Latania borbonica.
Maranta arundinacea.
Maranta bicolor.
Melastoma Fothergilla.
Menispermum Cocculus.
Melaleuca Cajuputi.
Mimusops Elengi.
Morus tinctoria.
Oreodoxia regia.
Pandanus odoratissimus.
Passiflora racemosa.
Piper Betle.
Piper nigrum.
Psidium chinense.
Terminalia angustifolia.
Uvaria odoratissima.
Vanilla planifolia.
Zingiber officinale.

(G.)

Copy of a Letter from G. Loddiges, *Esq., to the Author.*

Hackney, February 18, 1842.

My dear Sir,—In reply to your enquiries respecting the importation of living plants in your cases, I beg leave to say that my brother and I have, since 1835, made trial of more than 500 cases to and from various parts of the globe, with great variety of success; but have uniformly found, wherever your own directions were strictly attended to,—that is, when the cases were kept the whole voyage in the full exposure to the light, upon deck, and care taken to repair the glass immediately in cases of accident,—the plants have arrived in good

condition; but we have never found this so well attended to as in those cases with which we have been favoured by your friends, and particularly by Capt. Mallard, of the Kinnear; indeed amongst all we have sent out or received, none have arrived in such good order as those brought by this gentleman. I wish we had more that possessed his love for Natural History, and would take the same care which he has done, as we should not then have to deplore the number of importations totally ruined, even in your cases, simply for the want of the light of day, and these too under the care of captains who engage that they shall be kept upon deck, when the moment we are out of sight they stow them away below, and they are never more thought of until their arrival: from experience in this mode of transportation we are enabled perfectly to see by their state whether they have been placed properly or not; for we find that there cannot be a worse mode of sending living plants, than in these same cases, so placed in the dark. Some of the cases have been opened in fine order after voyages of upwards of eight months: in short, nothing more appears to be wanting to ensure success in the importation of plants, than to place them in these boxes properly moistened, and to allow them the full benefit of light during the voyage.

I remain, My dear Sir,
Ever yours most sincerely,
George Loddiges.

To N. B. Ward, Esq.

On the Yellow Colour of the Barberry, and its uses in the Arts. By E. Solly, Esq.

Having learnt, whilst engaged in inquiries amongst manufacturers and other practical men, that the root of the common Barberry, or Berberis vulgaris, was an article of increasing value in the arts, on account of the fine yellow colour which it contains, and that a new source of this dye stuff was rather a desideratum; I was led to inquire in how far the root in question could be advantageously obtained from India.

The most important use to which the colouring matter is applied, is, as I am informed by a gentleman well acquainted with the arts of dyeing, for the purpose of dyeing or staining leather yellow; for which purpose it is found peculiarly well suited.

The colouring principle is found in the bark and wood of the stem as well as in the root. But the root only has, I believe, been applied

in dyeing. In the specimens which I have seen, the colouring matter was in the stem for the most part collected together in the bark, and round the circumference; a considerable portion, also, was deposited round the pith, particularly in the larger stems; whilst the great bulk of the woody fibre intervening, contained very little colour. The root, however, was wholly of a fine yellow colour.

The gentleman before mentioned (and to whom I am indebted for much useful information on this subject) informs me, that the barberry he has seen was generally in large straight pieces, having a somewhat honeycomb cellular structure, and that the colour was generally collected together as it were in masses.

In the larger stems, the proportion of useless woody fibre to the bark and parts yielding colour, is undoubtedly large, but this is quite compensated by the superior richness of colour in the old stems.

According to some experiments of MM. Buchner and Herberger, which are detailed in the *Journal de Pharmacie,* the root of the Berberis vulgaris contains rather more than 17 per cent. of yellow colouring matter, which is entirely soluble in hot water, and to which the name of Berberite has been applied. The root, besides this, contains gum and many other substances, but it is the berberite alone which is available for the purposes of the dyer.*

Few natural orders are more widely distributed than the Berberideæ, for they are found in most temperate parts of the globe: species are found in most of the countries of Europe, and extend, as De Candolle has observed, from Candia to Christiania. In Asia, they are, perhaps, even more widely diffused and abundant. The best known varieties of Asiatic barberries are:—

1. *Berberis Sibirica.* A small shrub, found on the lower mountains and rocky hills of Altaic Siberia.
2. *Berberis Sinensis,* which abounds in China, and the northern parts of India.
3. *Berberis Wallichiana.* A native of Nepal.
4. *Berberis floribunda.* This plant, which is common in the whole of the north of India, was formerly thought by Dr. Wallich to be identical with Berberis aristata; it is now, however, known to be different.
5. *Berberis Asiatica.* Abundant in Nepal and Kumaoon; and according to De Candolle, the Berberis tinctoria, which flourishes in the Neelgherries, is identical with this species.

* This colour has been long used in Astrachan and Poland as a dye for leather, and in some parts of Germany for staining wood of a bright yellow colour.

6. *Berberis aristata*, perhaps the most widely diffused of all these species; it abounds in the mountains of Northern India, and extends from the Himalaya mountains to the Neelgherries, and as far south as Nuera Ellia, and Adam's Peak in Ceylon. It has been described in the *Botanical Magazine* under the name of Berberis chitra; it is, however, not the same as the Chitria of Nepal, which is another variety of Berberis.

Many of these species live for a long series of years, and attain very considerable size; according to Dr. Royle, Berberis Nepalensis, a most beautiful species, which inhabits the mountainous districts in the north of India, grows in shady places to the height of 12 feet at elevations of from 5 to 6,000 feet above the level of the sea; and M. Leschenault de La Tour states, that the Berberis tinctoria, which flourishes in the Neelgherries, and is there known by the name of Jakalow, attains a height of even 20 feet.

These different species of Berberis are employed by the natives in the districts where they abound, in medicine, and as a dye; and the fruit of some are dried and used as an article of food. The late General T. Hardwicke, in his Narrative of a Journey to Sirinagur, published in the *Asiatic Researches*, relates that a variety of Berberis is abundant in the valley through which the Koa Nullah has its course; the fruit of this variety is eaten by the natives, and the wood, which is of a bright yellow colour, is used by them for dyeing; but from the imperfection of their processes the colour so obtained is not permanent. Dr. Royle, in his *Illustrations of the Botany and Natural History of the Himalaya Mountains*, says, when describing the properties and uses of the Berbarideæ, "The root and wood of one species, the Berberis aristata, being of a dark yellow colour, and forming the Dar Huld of Persian writers, are used as a dye; and being bitter and a little astringent, are, together with the bark, employed in medicine. The variety of Berberis found in the Neelgherries, and which M. Leschenault de La Tour calls Berberis tinctoria, from the use to which it has been applied, has by the experiments of M. Vauquelin, been found to be inferior to few woods, for dyeing a yellow colour." There being fortunately preserved in the Museum of this Society, a small quantity of barberry root, which had been sent from Ceylon, together with other specimens of dye woods, &c., I have been enabled to make some experiments with its colouring matter, the result of which proved that it was quite as abundant in the Asiatic as in the European barberry; and on comparing it with some root from Cologne, I found that the colour from the Asiatic was even finer and more brilliant;

and from some experiments in dyeing cotton and silk with it, I have no doubt that it will be found, if not superior, at least quite equal, to the very best which has hitherto been obtained from Cologne, Hamburg, and some other European towns.

Experiments should be made as to the relative quantity and quality of colour contained in the old and young trees, and in their wood, bark, and roots respectively, and likewise as to the best time for collecting them.

As the root contains only about 17 per cent. of useful colouring matter, and the remainder consists of woody fibre and other matters not useful to the dyers, it is important to inquire into the possibility of substituting for the wood or root a watery extract of them. This would contain the whole of the colouring matter, and whilst it would present it in a condensed and convenient form, would of course greatly diminish the expense of carriage and freight, and, in consequence reduce the ultimate cost of the colour.

It is evident that there would be no great difficulty to prevent this being done, for the natives prepare extracts with great success, and have considerable experience in such operations, as we see from a number of Indian extracts, such as Cutch, and Terra Japonica, which have lately become important articles of trade. But there would be far less difficulty in obtaining the extract of barberry, than that of many other trees, for the natives have long made and used it themselves as a medicine, and it is described in the Asiatic books on Materia Medica, under the names of Rusot, Hoozis, and Huzuz. There can therefore be no difficulty in obtaining the article in any quantity which may be required.

It has long been remarked, as a curious circumstance, that Dioscorides has made no mention of the barberry, which from its wide diffusion and remarkable properties, could hardly escape the attention of the early naturalists. This has, however, been explained by Dr. Royle, who has adduced the most unexceptionable evidence to prove that the Lycium of the ancients, or Λύκιον of the Greeks, was really identical with the Hoozis of the present day, and was, in fact, an extract of barberry. A very interesting confirmation of this will be found in Avicenna, who, when speaking of Lycium, says it is the extract of Al-Feluzahargi, and Dr. Royle, in his paper on Lycium, informs us, that the Persian name of Rusot, the extract of barberry, is Feelzurch.

Some little confusion is caused by the term Dar Huld, or yellow wood, being applied to more than one plant; thus, among many others, Playfair, in his translation of the *Talif Sherif*, describes Dar Huld as

turmeric, and says, "it is pungent, bitter, hot, and dry," a description applicable to turmeric, but not at all to barberry, which is usually described as bitter, cooling, and slightly astringent: and Dr. Royle informs us, that in the north of India Dar Huld signifies barberry, and that on asking to see the plant yielding Dar Huld and Rusot, species of Berberis were pointed out; whilst in the south of India it is only applied to turmeric.—*From the Journal of the Royal Asiatic Society of G. Britain and Ireland, No.* XIII.

Experiments on the Dhak Gond, a natural Exudation of the Butea Frondosa. By Mr. E. Solly, Jun.

This substance, which although it differs in some particulars from the Kino which is found in the shops, yet as it agrees in its most important properties with what has so long been described under that name, it is most convenient to call it *Butea Kino.*

It is of a brilliant ruby red colour, transparent, and very brittle. It consists principally of small round tears, and other fragments, which from their form appear to have been detached from the lesser branches of the tree. When it has been kept for some time, it becomes opaque and dark coloured, this however may be prevented, according to Dr. Roxburgh, by preserving it in well-closed bottles. I have examined two specimens of this substance, one brought over by Mr. Beckett, and the other received from Bombay. There was considerable difference between the two, but from their properties it was evident that they had been originally similar. The following description is equally applicable to both specimens, except where it is otherwise stated.

When exposed to heat, the Butea kino swells up, emits fumes which are partially inflammable, and then ignites; if after that it is removed from the source of heat, it continues to glow like tinder, until nearly wholly consumed, a very small portion of a white ash only remaining. Ten grains of the kino, carefully selected as to purity, were ignited in a covered platinum vessel, and retained at a red heat until all the carbonaceous matters were burnt; there then remained 0.45 grains of white ash, a very small portion of which was soluble in acids with effervescence, the remainder consisted principally of silica and alumina. The specimens of Butea kino were far from being in a state of purity, being mingled with small fragments of wood, bark, and also with earthy impurities: these were evidently derived from the mode of collection, which most probably consisted in gathering from the ground under the trees the fragments of the natural exudations which had fallen

from them. The impurities in the specimen brought over by Mr. Beckett varied from 12 to 25 per cent., of which from 4 to 6 were earthy; that from Bombay contained in general far more impurities.

It swells and slowly dissolves in the mouth, having a pure, strong astringent taste, like the finer kinds of catechu. It has no smell. In cold water it swells, and slowly imparts to it its fine red colour; after some time only the outer portions of the kino remain, which by exposure to the air had become dark coloured and almost insoluble in water, whilst the whole of the interior and unaltered kino is dissolved. These insoluble portions consist principally of difficultly soluble extractive. A sufficient quantity of boiling water dissolves the whole, and on slowly evaporating the solution, the difficultly soluble extractive separates in tough red films.* The quantity of this extractive of course varies considerably in the two specimens, and influences their solubility. The Bombay variety is far less easily soluble in water, and clear solutions are much more difficult to obtain when made with hot water; they are very apt to become turbid, and if strong, gelatinise on cooling; and if the water contained any saline or earthy substances, this was almost certain to take place. From these circumstances it is rendered very probable that the sample from Bombay had been exposed to the air for a longer time than the other; it was most likely collected at another period of the year, after having remained exposed to the air, damp, and light, for some time. From the description of the properties of the exudation when fresh, and only just become hard, as given by Dr. Roxburgh, in 17—, it is evident that it should be only collected at that period, as it is then far more applicable to useful purposes, whether in medicine or the arts, than after exposure to the air, &c. Both alcohol and pyroligneous spirit dissolve a considerable portion of the Butea kino, but far less than water. Ether dissolves but little, and remains colourless; when a portion of ether is agitated with a strong aqueous solution it soon becomes thick, and, on evaporation, yields a considerable portion of tannin.

A small quantity of persulphate of iron changes the colour of the aqueous solution to a dirty green; a rather larger quantity occasions a copious green precipitate.

A series of experiments were made on the effects of various reagents on solutions of this kino, with a view to ascertain which were the best precipitates of the red colour, ether for dyeing, or as a pigment.

Solutions of most acids, and acid salts, changed the colours to a

* This also takes place with the kino of the shops.

light orange, and for the most part occasioned copious precipitates; they were nearly all of a dirty yellow or orange colour.

When a few drops of a strong solution of caustic potassa were added to the aqueous solution of the kino, the colour was immediately altered, and very much improved, becoming of the most splendid crimson; when however a little more of the solution of potassa was added, the colour rapidly became gray, and a copious precipitate fell. It very quickly became dark reddish gray, and nearly the whole of the colour was destroyed. Caustic soda and ammonia likewise improved the colour in the same way. When acids were added to solutions thus precipitated, so as just to neutralise the alkali, some of the precipitate redissolved, and the rest became orange. Carbonates of potassa and soda both very much deepened the colour of the solution: it was however not to be compared in beauty of colour with the solution obtained by the addition of a small quantity of caustic potassa, and had a slight brown tinge. In general most saline solutions occasioned precipitates which were either pink, gray, or colours between the two. Acetate of lead, as well as several other metallic solutions, precipitated the whole of the colouring matter. The precipitate obtained by adding a solution of alum either to a neutral solution, or to one containing a small quantity of alkali, was of a dirty pink colour. When gelatinous or recently precipitated alumina was agitated with any of the highly coloured solutions, it soon abstracted all the colouring matter, but the lake so formed was, like those formed by precipitation, of a dingy colour. The precipitates formed by metallic solutions were of very variable hues, but in no case were the colours so obtained decided or brilliant. Attempts were likewise made to fix the colour in the fibre of cotton, silk, wool, &c., in various ways, and with different mordants; the colours were all imperfect, dingy, and variable in colour, but they were very permanent. This agrees with the results obtained by Dr. Roxburgh,* but as his experiments were made on the fresh substance, they were under more favourable circumstances. The cause why these colours cannot be well employed is, that the red colouring matter is so intimately combined with the tannin and gum, that whenever the one is precipitated, it carries down the other also, and hence, when we endeavour to precipitate the tannin alone, the red colour or extractive is always precipitated with it: this, as will presently appear, is in some cases a great inconvenience.

A solution of gelatine produced in aqueous solutions of the Butea kino, an abundant precipitate of tanno-gelatine, which always contained a portion of colouring matter: this varied very considerably between

the two portions of kino, that from Bombay containing by far the most: when a solution of the kino from Mr. Beckett, either in cold water, or still better in alcohol was precipitated, the tanno-gelatine contained very little colour. The solution, after the separation of the precipitate, contained gum, extractive, gallic acid, and minute portions of other matters: the quantity of gallic acid was very various, but in no case did it appear to exist in any considerable proportion.

It was difficult to ascertain the exact per centage of tannin, as it varied very much in different specimens submitted to examination. I have therefore repeated the experiments on several portions, and shall now give the mean of some of the best results obtained.

One hundred parts of the rough kino from Mr. Beckett were dried for 6 hours at a temperature of about 130° Fahrenheit; they lost 13-23 parts of water. Much of this water was derived from the wood, bark, and impurities, for the pure substance when separated was far less hygrometric. The kino thus dried was digested in water kept nearly at the boiling point, until a strong solution was made; this was then poured off, and the process repeated with fresh portions of water, until all the matters soluble in that fluid had been thus removed. The residual matters, consisting only of impurities, weighed 17 parts. The solutions were then rapidly evaporated to a considerable degree of concentration, during which 3-5 parts of difficultly soluble extractive fell down. It was necessary to complete this evaporation as rapidly as possible, because if, the hot solution was long exposed to the air, it became much darker coloured and was somewhat altered in properties. The solution was then precipitated by a strong solution of gelatine, of which 28.3 parts were employed. The precipitate, when collected, washed, and carefully dried, weighed 79 parts; by subtracting from this the weight of the gelatine employed, the proportion of matter precipitable by animal jelly is ascertained to be 50.7. This was of course principally tannin, but it contained a portion of coloured extractive which gave to it a dark colour, varying in depth with the circumstances under which the solution was made, &c. The remainder of the solution, after the separation of the tannin, was evaporated; it contained gum, a small quantity of gallic acid, extractive, and minute traces of saline and earthy matters, weighing in all 15 parts. The Bombay kino contained less tannin and rather more gallic acid and extractive, and by long continued boiling with free access of air, the composition of either kind might be easily modified. If this substance were to be employed in the arts, it would be very probably most convenient to obtain it as an extract, unless by so doing it became much darker in colour. By dissolving

the tannin by cold water, I have obtained extracts in which the per centage of tannin was as high as 75°, and sometimes even higher; but these extracts were made under the most favourable circumstances, being prepared with rapidity and the least possible exposure to the air. It would be utterly impossible to manufacture the extract in the large way in this manner, if the causes above mentioned do not prevent it, but it might very probably be advantageous to prepare the kino of the Butea as an extract, as the cost of freight would be therefore less.

From the large per centage of tannin which this substance contains, as indicated by the above experiments, and from its probable cheapness, it promises to be of considerable value in the arts, and especially in that of tanning leather. As a substitute for the astringent substance now in use, its adoption in many cases from convenience or economy are self-evident, and require no comments; but in the art of tanning leather so many points require to be considered, that it is necessary to say a few words on that subject. On putting a piece of pelt or prepared skin into a strong solution, it soon absorbed a considerable quantity of tannin, but, at the same time, became of a rather dark colour; this is an unfortunate quality, because, as the consumers of leather judge of its quality in part from its colour, the tanners do not like employing anything which deepens the colour too much. The colour taken up by the leather of course varied with the solution employed, a cold solution of the kino from Mr. Beckett giving a much lighter coloured leather than a hot-made solution; that from Bombay gave a darker colour, and the solution was very subject to gelatinise and become turbid; this of course would be a great inconvenience. The leather tanned with this kino was very hard and rather brittle, but it was tanned with considerable rapidity. These results were obtained on small pieces of thin skin, and I do not anticipate that it will answer at all for tanning such skins: its richness in tannin, however promises well for tanning thick hides; and the results of experiments on its application to this process, now in progress, will be communicated on a future occasion.—*Ibid.*

Monthly Proceedings of the Society.

(*Wednesday, the* 11*th December,* 1844.)

C. K. Robison, Esq., Vice President, in the chair.

The minutes of the last general meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the November Meeting were duly elected Members of the Society; viz.

Messrs. J. G. Llewelyn, E. V. Irwin, and Charles Macleod.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Lieut. E. H. Impey, Assistant Commissioner, Tenasserim Provinces,—proposed by Mr. Edward O'Riley, seconded by the Secretary.

Baboo Hullodhur Bhose, Merchant, Calcutta,—proposed by Dr. Huffnagle, seconded by Mr. Balfour.

Charles Sutherland, Esq. Moulmein,—proposed by Mr. W. G. Rose, seconded by Mr. Wm. Storm.

G. B. Robinson, Esq. (Messrs. Boyd, Beeby, and Co.),—proposed by Mr. W. Storm, seconded by Dr. Huffnagle.

Presentations to the Library.

1. Journal of the Asiatic Society of Bengal, Nos. 64 and 65. —*Presented by the Society.*

2. The India Journal of Medical and Physical Science, No. 11, of vol. 2.—*Presented by the Proprietor.*

Garden and Museum.

1.—A small supply of Nepaul Munjeet Seed.—*Presented by Major H. M. Lawrence.*

2.—A few bulbs of a plant which grows in the island of Chedooba, and specimen of powder prepared therefrom; also specimens of Arrow-root bulbs and powder.—*Presented by Major D. Williams.*

Major Williams mentions that the farinaceous food prepared from the above bulbs is equal, if not superior, to that prepared from the Arrow-root. The powder sent by Major Williams was prepared under his own superintendence after the manner the Mugs prepare it for exportation to the Eastward, chiefly, he believes, to the China market. The Arrow-root, Major Williams adds, grows all over Arracan, and is eaten as a vegetable.

The Secretary stated, that so far as his enquiries extended, this bulb is unknown in Calcutta and its vicinity. He had requested Major Williams to send a few of the plants and a larger quantity of bulbs, for culture in the Society's garden, and would endeavour, in the meantime, to obtain a report on the quality of the powder, in comparison with that of the Arrow-root.

3.—Sundry samples of Cotton grown at different places in the Dacca district, from American seed distributed by Mr. Price.—*Forwarded by the Government of Bengal for report.*

4.—Two musters of Sugar, three specimens of soils, and three indigo-giving plants, all from the Tenasserim coast.—*Presented by Edward O'Riley, Esq.*

Improvements at the Garden, and proposed extension thereof; Otaheite Cane; Fruit tree Nursery; Experiments with Manures, &c.

A long report was brought up from the Garden Committee. The Committee intimate the completion of the long pucka walk through the garden, and the progress making in trenching about 15 begahs of ground. They allude to the demand this season for Otaheite cane having far exceeded the supply, and mention the means they have adopted to meet a probably large demand next year. They refer also to the proposed Orchard, which is to comprise a piece of ground of about 15 begahs, extending from the eastern to the present western boundary of the garden, and from the new road to within a few yards of the north boundary; and suggest that application for fruit trees be made to five other localities than those named in a former report. The Committee annex a statement regarding the experiments with manures, which were suggested by Sir Lawrence Peel, from which it would appear that the plots manured with cow-dung have given a far better produce than any other article; oil cake

comes second in the list; Penang and Peruvian guano the third; and tank earth the last. In regard to the guano, however, the Committee express a doubt as to the quantity employed being sufficiently large, and suggest another trial with about double the quantity. The Committee likewise suggest, that a portion of the supply of guano presented by Mr. W. P. Grant, be distributed among the members, on the understanding that applicants communicate the result of their experiments to the Society. The Committee conclude their report with a recommendation that the Government be solicited to grant an extension of ground to the Society, for various reasons therein detailed.

Proposed by Dr. Huffnagle, seconded by Mr. Haworth, and resolved, that the Report of the Committee in all its parts be confirmed, and that an extract of the latter portion be sent to Dr. Wallich, Supt. of the Botanic Garden, with a request, that he will address Government on the subject of the proposed additional grant of ground.

Floricultural Exhibition.

Another report was submitted by the Garden Committee, annexing a schedule of prizes, amounting to 150 Rs., to be awarded from Sir Lawrence Peel's quarterly donation, for the first floricultural exhibition for 1845, and suggesting, with reference to the season being so backward for annuals, that the show be delayed till the latter end of January or early part of February.

The Committee recommend that a preference be given at this show to plants in pots, and that due notice be given that, at future shows all the indigenous plants be exhibited in this manner, as also all others of small size. Further, that at this and all other exhibitions, all specimens be kept distinct from one another;—dahlias in one vase, heart's-ease in another, a collection of passifloras in another, and so on. The Committee also recommend, that the schedule of prizes and conditions be printed in English and Bengalee, and distributed to all applicants, due notice of the same being given in the newspapers and bazars.

With reference to the question referred for their consideration, as regards the admission of the produce of private gardens, the Committee conceive that, taking into account that exhibitions of this

nature are yet in their infancy, it is desirable, at any rate for the present, that the *malees* of private gardens be allowed to compete, in common with other gardeners.

Proposed by Mr. Colin Campbell, seconded by Mr. W. Haworth, and resolved, that this report be confirmed, and that the exhibition be held on the 29th of January.

Horticultural Exhibition and Anniversary Dinner.

A report from the Fruit and Kitchen Garden Committee was next read. The Committee submit a schedule of prizes, amounting to 126 Rupees and 4 silver medals, for the first quarterly exhibition of vegetables and fruits for 1845. The Committee subjoin a memorandum of the amount that has been disbursed for prizes during 1844, and request that the sum of 400 Rupees, inclusive of the cost of medals, be allowed for the next year.

Proposed by Mr. Haworth, seconded by Mr. Campbell, and resolved, that the sum of 400 Rupees be placed at the disposal of the Committee; that the exhibition be held on the 15th January, and the annual dinner on the evening of the same day.

Sugar Duty Question.

The Secretary placed on the table the minutes of the members of the Special Committee, who were appointed at the October meeting, to take into consideration the subject matter of a letter from Mr. Sconce on the above question, and mentioned, that although some delay had occurred, the Committee hoped to lay their report before the Society at its next meeting.

The Patron of the Society.

The Secretary intimated to the Meeting, that in accordance with the Society's request, the President had communicated with the Right Honorable the Governor General with respect to the Patronship of the Society, and that His Excellency had expressed his readiness to accept of the office.

Provision for Garden and Flower Seeds for 1845.

The Secretary submitted an estimate of the probable amount requisite for the consigments of garden and flower seeds for the next year, amounting to Rs. 3,450.

Resolved, that this sum be voted, and that the Fruit and Kitchen Garden Committee be requested to arrange the details.

Introduction of Carolina Paddy into Arracan.

The following communication from Government, forwarding an application from Major Bogle, the Commissioner of Arracan, for a supply of Carolina paddy for cultivation in that province, was next read.

To the Honorary Secretary, Agricultural and Horticultural Society.
Revenue.

Sir,—I am directed by the Right Honorable the Governor of Bengal to append copy of a letter from the Commissioner of Arracan, dated the 11th instant, applying for a quantity of Carolina paddy seed, as to the expediency and best mode of supplying which His Excellency will be happy to be favoured with the views of the Society.

I have the honor, &c.,
C. Beadon,
Under-Secy. to the Govt. of Bengal.
Fort William, 27th November, 1844.

The Secretary stated, that on receipt of the above letter, he had placed himself in communication with Mr. Wm. Haworth on the subject (as he had on several previous occasions taken much interest in the introduction of Carolina paddy into India,) who suggested a reference to some of the firms connected with the regular trading vessels between Boston and this port. He had now the pleasure in pursuance of that suggestion, to submit a letter from Messrs. Smith, Huffnagle and Balfour, agreeing to execute the order of Government in the most handsome manner, asking for their re-imbursement merely the actual cost and charges defrayed by them.

Resolved, that a copy of this letter be forwarded to Government.

Communications on various subjects.

The following papers were likewise submitted :—

1.—From Cecil Beadon, Esq., Under-Secretary Government of Bengal, forwarding for the Society's report, the samples of Dacca grown cotton alluded to among the presentations, and submitting further reports by Mr. Price, and certain correspondence on the subject of the proposed experimental Cotton Farms in the Dacca district.

2.—*From Col. J. R. Ouseley, forwarding a price current from the* Hoosungabad district, of wheats and linseed (red and white,) for several years past, (which has been furnished him by the Deputy Commissioner, Capt. Spence,) and offering some remarks thereon.

3.—From Dr. Gibson, giving in reply to the Society's application, a few particulars regarding the temperature of Hewra, its distance from the Sea, &c., and the condition of the olive plants which he established at the Botanic Garden at that place about 3½ years ago.

4.—From Capt. Goodwyn, submitting a report on the piece of Arracan teak presented at the last meeting by Major Bogle.

5.—From Edward O'Riley, Esq., giving an account regarding the soils, plants, &c. alluded to among the presentations.

6.—From Dr. Alexander Gibson, Supt. Government Botanic Gardens, Bombay Presidency, enclosing a memorandum on the mode of cultivating tobacco at Latakia, and affording a few additional particulars regarding the ground-nut and castor-oils, expressed by Bramah's Press.

The above communications were transferred to the Committee of Papers.

7.—From J. O. B. Saunders, Esq., intimating, in reply to an enquiry, that the white linseed is unknown at Allahabad and in the Doab.

8.—From Capt. G. E. Hollings, stating, that as far as his information at present extends, the white linseed is not cultivated in Oude. Captain Hollings sends a small quantity of the white *Til* grown at Lucknow.

9.—From Dr. Griffith, giving an analysis of the replies to questions put to various parties in Calcutta and in different parts of India, to whom bulbs were forwarded from the supply transmitted by Mr. Groom in 1843.

Resolved, that a copy of this analysis be sent to Mr. Groom, and the amount of his bill be liquidated.

For all the above communications and presentations, the best thanks of the Society were accorded.

Report of the Agricultural and Horticultural Society of India, for the year 1844.

The close of another year of the Society's existence renders it necessary to offer a short summary of its proceedings since the submission of its report for 1843.

Introduction.

The internal economy of the Society is the subject which perhaps claims priority of notice. Since the close of the last year, there has been an accession of forty-seven new members. Of these seventeen are Civilians in the service of Government, nine are Military and Medical Officers, six are Indigo Planters, eleven are Mercantile, two are of the legal profession, and two are of a miscellaneous class. The loss from deaths has been the same as last year, while that from resignations has been considerably less. There have been fifteen deaths, thirty-three resignations,—eleven being in consequence of departure from the country,—and six, (Messrs. G. DeGorastiza, Edward Bathurst, G. R. Dennison, Captain R. Wroughton, Mirza Mehdi Meskie, and Baboo Cossinauth Bhose,) struck off for non-payment of subscriptions; in all fifty-four.

Economy of the Society.

The following tabular statement affords the details more fully in comparison with foregoing periods, and at the same time represents an analysis of the constitution of the Society:—

	In 16 former years.	In 1837.	In 1838.	In 1839.	In 1840.	In 1841.	In 1842.	In 1843.	In 1844.	Gross Total.	Total real number at the close of 1844 after deducting lapses.
Honorary Members, ...	6	1	0	1	0	2	0	1	0	11	9
Free Members, ...	0	0	0	0	0	0	1	0	1	2	2
Civilians in the service of Government, ...	46	41	11	27	27	19	21	14	17	223	169
Merchants and Traders, ...	31	36	28	15	19	13	18	16	10	186	124
Indigo and other Tropical Agriculturists, ...	25	21	43	23	27	21	7	15	6	188	97
Military Officers, ...	34	17	18	15	18	21	4	16	4	147	89
Medical ditto, ...	14	16	10	7	7	10	9	1	4	78	37
Asiatics, ...	13	9	7	1	7	8	6	5	1	57	35
Clergy, ...	5	2	2	1	0	1	1	1	0	13	3
Law Officers, ...	14	5	1	5	3	0	6	2	2	38	24
Miscellaneous, ...	0	0	3	0	2	0	2	0	2	9	5
	188	148	123	95	110	95	75	68	47	952	594

If from this return of five hundred and ninety-four Members, thirty-eight who have compounded for their subscriptions be deducted, with nine Honorary Members, *one hundred and thirteen* absentees in Europe, and two Free Members,* there will remain four hundred and thirty-two as the actual number of paying Members now on the books of the Society.

Necrology.

Among the Members who have been taken away from the Society by death, Baboo Ramcomul Sen may perhaps be reckoned as the foremost whose loss has to be deplored. Connected with the Society very shortly after its formation, he was one of the few of its remaining original Members. For several years he held the post of Native Secretary and Collector, and, at a more recent period, he was a Vice-President of the Institution. The good example he set his countrymen, and that too at a time when they gave little or no attention to any matters connected with the welfare of the country, is deserving of much praise. In his regular attendance at the monthly meetings, and in the lively interest he took in agricultural pursuits, the Society regrets to add, he stood almost alone among the Native Members of the Institution. An useful Member of the Society has also been taken away by the hand of death, in the person of Mr. G. F. Hodgkinson, who was at all times ready to afford the institution the benefit of his services: from his practical knowledge of many of our Indian fibrous vegetable substances, he was in particular an excellent Member of the Hemp and Flax Committee. In Mr. M. A. Bignell, a Member of its Committee of Papers, the Society has also lost a valued adherent.

Besides these names, the Society has to regret the loss of Captain H. Bigge, Assistant to the Commissioner of Assam; Mr. J. C. C. Sutherland, Secretary to the Indian Law Commission; Mr. T. P. Morrell, Merchant of Calcutta; Mr. George Henderson, Attorney, Supreme Court, Calcutta; Major E. Pottinger, C.B.; Mr. Chas. Oman, Indigo Planter, Jessore; Rajah Cowrkrishnath Roy, Behadoor, Rajah of Cossimbazar; Mr. G. H. Clarke of the Civil Service;

* Captain E. P. Nisbet, commander of the *Agincourt*, was elected a free Member during the present year.

Revd. H. Pratt, Chaplain at Nusseerabad; Baboo Bissonath Mutteeloll, Merchant, Calcutta; and Major H. Carter of the 73d N. I.

Indian Wheat Question. Petition to Parliament.

In the last report an allusion was made to the steps which had been taken, by a Committee specially appointed, for obtaining information respecting the cultivation and production of wheat in India, previous to the drawing up of a petition to the Home Government, for its admission into British Ports on an equalized duty with the produce of Canada. The Society has pleasure in stating, that the enquiries of its Committee, though not responded to by all the parties addressed, have elicited much valuable information from Behar and Upper India. The substance of this information will be found in No. XI., of the second volume of the Journal, published in the early part of the year. A report,* and a long tabular statement based on this information, were presented at a *special* meeting held in March, at which it was resolved, that a petition to both Houses of Parliament should be prepared. A form of petition was accordingly submitted, agreed to at the following general meeting, and transmitted by the March mail to the care of the Earl of Auckland, (the former Patron of the Society,) and Joseph Hume, Esq. At the August meeting the replies of the Earl of Auckland, and Mr. Hume, were submitted. After stating, that feeling strongly the justice of the prayer, he had not hesitated to lay the petition before the House of Lords, and to express his opinion in its favor, the Earl of Auckland remarks, "I would fain hope that at no very great distance of time the relaxation of duty which has taken place to the advantage of Canada, will be extended to the other dependencies of the Crown. I much, however, regret that the discussion which took place in the House of Commons, on the 26th of March, holds out no prospect of an immediate and favorable consideration of the subject by the Government." Mr. Hume lost no time in sending a copy of the

* In this report the Committee observe, that "the result of the investigation has been to satisfy them that this country is able to grow wheat that would find a ready sale in the home market, and that it can be produced and exported at such cost as would yield a very liberal return for the capital employed."

petition to the Court of Directors, who forwarded it to the Board of Control, with the expression of their earnest hope, that it would receive due attention from Her Majesty's Government. In a second communication Mr. Hume adds, "On the 31st of May, I presented the petition, and gave notice that on the 3d of June, I should move to have the petition printed, with the intention of bringing on a discussion of the subject at an early day. But I must add, that the question having been settled at the general debate on Mr. Hutt, 'for all the colonies,' I cannot expect any other result than rejection of my motion."

Since that period the Society has not received any further communications in respect to this petition; so the question, for the present at least, may be considered as having been unfavorably disposed of. But though the agitation of the subject has not produced any immediate benefit, it has been the means of procuring information which can scarcely fail to be of service on any future re-opening of the question.

Sugar Duty question.

The next subject in point of importance, though one of the last as respects the period in which it was brought forward, that has engaged the attention of the Society, is that, connected with the proposed change, by the British Parliament, during the session of 1845, of customs duty on East Indian grown and other sugars. The matter first came before the Society at its Meeting in October, in the form of a communication from A. Sconce, Esq., of the Civil Service, urging the propriety of some prominent steps being taken by the Society, for the purpose of representing the interests of India in this important question. Appreciating fully the value of this suggestion, and with a view to give effect to it, the Society lost no time in appointing a special Committee, who, having given full consideration to the subject, are unanimously of opinion, that a petition should be presented to the two Houses of Parliament, and they hope to submit the draft of one at the first Meeting in 1845. As the result will naturally form a subject of fuller notice in the next annual report, it is unnecessary, and would perhaps be premature, to add any thing further regarding the question on the present occasion.

The cotton culture in India, but more particularly in the district of Dacca, has somewhat engaged the attention of the Society during the past year. As the various communications* which have been transferred by the Government of Bengal to the Society, regarding the measures which it has taken with a view to the introduction of foreign cotton into the Dacca district, and for the improvement of the indigenous varieties, are published in the numbers composing the third volume of the Society's Journal, it is perhaps unnecessary in this place to enter into detail on the subject. It may, however, be mentioned, that after an inspection for several months, of various localities in the district, Mr. J. O. Price, the gentleman appointed by Government to survey that part of the country, and who has had experience in cotton cultivation in the United States, has given his opinion to the effect, that not only the indigenous but exotic cottons can be grown to a large extent, with great prospect of success, in many parts of the Dacca district. The Government has accordingly sanctioned the formation of an experimental farm on the banks of the Banar River. In consequence, however, of the lateness of the season, it has been thought desirable to postpone the commencement of operations till next year, which will also allow a longer time to make all the necessary preliminary arrangements. At the request of Government, the Society transferred to Mr. Price a large quantity of New Orleans cotton seed, acclimated at the Coimbatore farms, for the new plantation, but this supply not being immediately required for that purpose, it has been distributed among such Zemindars of the district as have agreed to pay attention to the culture.

Cotton Culture in the district of Dacca.

It was stated in the last report, that the Honorable the Court of Directors had agreed to meet, to a certain extent, the request of the Society, preferred in 1841, in respect to the despatch of Agricultural and other seeds of an useful kind, when

Renewed application to the Honorable Court of Directors for occasional supplies of Agricultural seeds.

* See Mr. Price's reports of his proceedings from November 1843, to August 1844, and an interesting paper from the pen of J. Dunbar, Esq. Commissioner of the Dacca Division, on the present state of the manufacture of cotton fabrics in that quarter.

the direct communication between Suez and Calcutta, by steam, had been effected; and further, that they had promised to "take opportunities of sending occasional supplies of such seeds as are deemed of importance, by the most speedy conveyance." In consequence of the Society not having been favored with any of these promised supplies, and with reference to the great and increasing desire felt by many Members to improve the Agricultural resources of the country by a constant distribution and interchange of useful seeds, to an extent beyond the means of the Society, it was deemed advisable, at the February meeting, to address the local Government again on the subject, with a respectful request, that they would transmit this second application to the Honorable Court. At the meeting in May, a communication from Mr. Secretary T. R. Davidson was submitted in reply, intimating that this renewed application had not only been forwarded, but that the request had been recommended to favorable consideration by the Government of India. Up to the present time, the Society has not been favored with a reply to this application, but it trusts to receive a favorable one in the course of the ensuing year.

Branch Agri-Horticultural Societies, and Public Gardens.

Formation of a Branch Society at Simla.

In addition to the newly formed branch, and other Agricultural and Horticultural Societies during 1843, the Society has the gratification of announcing the very recent establishment of a Branch Institution at Simla. This Society has resolved on forming a large garden as the first step in their career of proposed usefulness. From the congeniality of the soil and climate of that mountainous region for the culture of most of the plants indigenous to Europe, there is every probability of this Society proving an useful auxiliary.

Dissolution and resuscitation of the Branch Agri-Horticultural Society at Hooghly.

In the early part of the year intimation was received of the dissolution of the Branch Society at Hooghly, proceeding mainly from a want of support on the part of the native landholders of that district. The Society has, however, the pleasure of adding, that by the exertions of a few of the principal European residents at the station, this institution has been lately resuscitated. A large garden has already been formed in a centrical position. Circulars have also been issued, urging the co-operation of the Zemindars and

other wealthy members of the native community, as the parties who will most materially benefit by the exertions of the Society. This call has been well responded to as yet, the donations amounting to about Rs. 2,600, and the monthly subscriptions from 41 Members, being Rs. 67.

Continued prosperity of the Branch Agri-Horticultural Society at Bauglepore.

The Branch Society at Bauglepore continues to flourish under the management of its zealous Secretary, Major Napleton. This institution now reckons about 160 members, with every probability of a greater increase. Several exhibitions have been held during the past twelve months, at which Agricultural as well as Horti-floricultural produce have received encouragement. In return for a quantity of imported seed, the Parent Society has obtained a good supply of acclimated vegetable seed from the garden of this auxiliary, which has been considerably enlarged to admit of the culture of various Agricultural products.

Branch Agri-Horticultural Society at Cuttack.

From Captain W. W. Dunlop, Secretary of the Branch Society at Cuttack, several communications have been received. Besides the cultivation of flowers and vegetables of all kinds, this institution has much increased the stock of Otaheite sugar cane in its garden.* This cane is in a most flourishing condition, and a quantity has been distributed over the district.

Public garden at Lucknow.

The Society has also been favored with various interesting reports from Captain G. E. Hollings, regarding the public garden at Lucknow; Captain Hollings has not only sent down a small assortment of flower seeds, and some vine-cuttings, but has very liberally offered to give to any Members of the Society, who may require them, acclimated seeds of every fruit, flower and vegetable which he may succeed in rearing.

Public Gardens at Benares and Budaon.

The Society has likewise received intimation of the establishment of a public garden at Benares. To that at Budaon a second large assortment of seeds has been despatched.

* A list of plants under cultivation in this Branch Society's Garden, is published in the third volume of the Journal.

In the report for 1842, it is stated, that with a view to encourage the planting of trees in the North-western Provinces, H. C. Tucker, Esq. of the Civil Service, had transferred to the Society a gold medal and 300 Rupees, to be awarded to any person who should shew the largest new plantation of trees in the Agra presidency, at the close of the year 1842. Notwithstanding that every publicity was given to this offer, no claimant had come forward up to the close of 1843. It was therefore thought advisable to direct the prize to some other object of Agricultural utility, and in communication with the donor, it was suggested by the Committee of Papers in the early part of the year, and agreed, to offer it to any person who will produce a good *vernacular* Hand-Book of Agriculture, Horticulture and Farming, suited to natives of India, giving them practical hints on the improvement of produce by change of seeds; rotation of crops; artificial grasses, &c. &c. with a brief explanation of the *rationale.* It may here be mentioned, that a claimant for this prize has already appeared, and his work is under the consideration of the Committee of Papers.

Prize for a good Vernacular Hand-Book of Agriculture, Horticulture and Farming.

The Society has paid considerable attention, during the year, to its labours in the Horticultural department. As the proposed change from an annual to quarterly exhibitions of indigenous and foreign vegetables and fruits, was agreed to in 1842, (though it was not thought necessary to carry it fully into effect till the following year,) it is cursorily glanced at in the report for that year. The bringing of our vegetables and fruits earlier into the market, and retaining them longer in season, is the principal object contemplated by this arrangement. Three shows have been held during the year, namely, in the months of January, May and October. The native gardeners appear to understand the objects aimed at by this change, and so far as the result of one year's experiment admits of an opinion being formed, it seems likely to answer the anticipations of the Society. In connection with this subject, the Society desires to allude to the liberal donation of 264 Rs. which has been placed at its disposal by a member (W. P. Grant, Esq.,) for the express purpose of improving the growth of celery, a vegetable which,

Change from an annual to quarterly Exhibitions of vegetables and fruits.

though requiring more, has received less attention at the hands of the native gardeners, than perhaps any other of the more common European vegetables. It has been agreed to have three shows in 1845, namely, in March, May and October, being the periods when this vegetable is respectively at the greatest perfection, at the latest season to which it can be kept back, and the very earliest time for production. With the view of giving every assistance to the *mallees* in competing for the handsome prizes to be awarded at these shows, the Society has distributed among them directions, (printed in Bengallee,) for cultivating this vegetable, and as a long time has been allowed them for its cultivation, it is expected the result will be satisfactory.

Establishment of Floricultural Exhibitions.

A new feature in the proceedings of the Society during the past year, consists in the encouragement which it has commenced to give towards the improvement of flowers. It can scarcely fail to be apparent, that within the last few years a greater degree of interest than formerly existed, for floricultural pursuits, has arisen among all classes of the inhabitants of this presidency. For some time past the Society has lamented that the many other, perhaps more legitimate, calls upon its funds have prevented its fostering this growing spirit for so delightful a recreation. Now, however, it has the gratification of stating, that this difficulty has been removed by the liberality of a zealous patron of floriculture, Sir Lawrence Peel, who has placed the sum of four hundred Rupees per annum at the disposal of the Society, chiefly with the view of encouraging a taste in the growth and improvement of flowers. To carry out the object of the liberal donor, the Society has established quarterly exhibitions of flowers. A commencement was made in October, at which the produce of private gardens formed the chief part of the show; but there is little doubt, now that the circumstance is more fully known, that native nurserymen will also enter the field as competitors.

Medals awarded for Cattle.

In the department of rewards, the Society has to report, (in addition to the prizes at the quarterly shows of vegetables, fruits, and flowers,) the adjudica-

tion, at the exhibition of cattle held on the 1st of February, of the following medals :—

To Mr. C. Ladd, for the best imported cow of any denomination, the silver medal.

To C. J. Richards, Esq. for the best cross, the produce of an imported bull or cow with native stock, the gold medal.

To Mr. A. Rose, for the best bull-calf of any denomination, calved in 1843, the gold medal.

To Mr. J. Wallace, for the best cow-calf of any denomination, calved in 1843, the silver medal.

To William Storm, Esq., for the best wooled cross between an imported ram or ewe and indigenous stock, the gold medal.

To John Muller, Esq., for the second best wooled cross between an imported ram or ewe and indigenous stock, the silver medal.

For the reasons given in the last report; namely, "that the attempt to improve cattle and sheep by money premiums and medals, has not held out sufficient encouragement in the number of cattle brought forward at the shows, to induce a continuance of the annual exhibitions," the above was the last exhibition of the kind under the patronage of the Society.

In consequence of the continued deprivation of the privilege it formerly enjoyed of transmitting *agricultural* seeds all over the country free of postage, the Society has not been able to do so

Agricultural Department.

much in this department as could be wished. It has, however, sent occasional supplies to members and others, whose localities are situated at or near the line of route traversed by the Government steamers, the privilege of free transmission by that channel being still allowed.

It was mentioned in the report for 1843 that, to meet the numerous demands for Carolina paddy, the Society had ordered, through the friendly agency of Messrs. Haworth and Hardman, of this city, a consignment of seed which was expected in April of

Carolina Paddy.

this year. This expectation has not been realized. The order was unfortunately lost in the *Memnon* steamer, and the duplicate order reached too late to allow of the agents at Liverpool acting thereon, with any probability of their procuring seed direct

from Carolina in time for the sowing season here; they were also unsuccessful in their endeavours to procure any good and fresh seed in the market. This has been a great disappointment, for in addition to the previously registered applicants, several others had requested to be supplied from this expected consignment. Being well aware, from trials given to seed furnished him by the Society three years ago, how admirably the soil and climate of Arracan are suited to this description of paddy, Major Bogle, the Commissioner of the province, applied to the Government of Bengal to procure a large quantity of the grain for him for distribution among the best cultivators, with the view of fully introducing it into that large rice-producing country. The Government, in a communication submitted at the December meeting, requested to be favored with the views of the Society, as to the expediency and best mode of meeting this application; and the Society, in reply, has strongly seconded the request, under the impression, that if carried out in the judicious manner proposed by Major Bogle, the introduction of so superior a description of paddy, can scarcely fail to add materially, in the course of time, to the resources of the province under his charge. The Society has also pointed out what, in its opinion, would be the best course to adopt to give due efficacy to this application.

Australian Wheat, Madder Seed, Wheat and White Linseed from Central India.

In connection with this department it may be mentioned, that the sum of £20 has been voted for a consignment of seed corn from Launceston and Sydney; and at the recommendation of a member, (J. Cowell, Esq.,) to whom the Society is indebted for several other useful suggestions, a small sum has been reserved for a limited supply of madder seed from Belgium or the South of France. From Colonel Ouseley, Agent to the Governor General, South West Frontier, who has exerted himself for several years "in bringing to notice the vegetable products of the districts under his charge, as well as the valuable grains of Central India,"* the Society has

* Mr. Griffith, in his paper on the Palms of British East India, in the Cal. Journal Nat. Hist. vol. 5, page 348, observes in reference to the *Phœnix Ouseleyana*, (n. sp.) "Colonel Ouseley, A. G. G. S. W. Frontier, first directed my attention to the distinguishing marks of this species, which I have therefore dedicated to him, and also as a tribute of respect for his exertions in bringing to notice the vegetable products of the districts under his charge, as well as the valuable grains of Central India."

received a fine supply of wheats of sorts and of *white* linseed, procured at Hoosungabad. This latter article appears to be quite unknown in Behar and Upper India, and so far as the present enquiries of the Society extend, its cultivation would seem to be confined to the Nerbudda valley. A portion of this supply was sent, among other places, to Bhauglepore for trial in the Branch Society's garden, and Major Napleton reports, that "the linseed has come up most beautifully, and promises an abundant crop. The introduction into the Bhauglepore district," he adds, "appears to have excited considerable attention."

Horticultural Department—Garden and Flower Seeds.

In the Horticultural department, garden and flower seeds have been obtained from America; garden seeds from the Cape; and flower seeds from England. The supply from America was received at two different times, the first consignment proved indifferent, the second was tolerably good. The seeds from the Cape have proved to be very good, but their receipt at a very late period of the season, has prevented several of the members in distant parts of the country, from participating in the distribution. This circumstance has been duly notified to the seedsmen, and it is hoped, that the steps taken by the Garden Committee, will prevent its recurrence. The Society regrets to add, that the flower seeds from England have entirely failed.* The Society does not attribute blame to the seedsmen, (Messrs. Veitch and Son, of Exeter,) for this failure; but, with the view of inducing a greater competition, the amount voted for the next season has been divided between them and Mr. Carter of High Holborn, London, who has been strongly recommended to notice by a member.

The garden of the Society has been duly attended to during the year. With the view of improving the soil, about 15 begahs of

* Major Napleton states, that many of the garden and flower seeds sent by these seedsmen for the Bauglepore Branch Society, have failed to germinate this season, though the supply of 1843 was of excellent quality. He attributes this failure to the seeds having been packed in *tin*, as was the case with the consignment forwarded to the Parent Society. It is, however, worthy of notice, as regards the packing of seeds in tin, that this mode has been always adopted by the Society's seedsmen at the Cape and at Philadelphia, and the seeds have generally given satisfaction.

ground have been deeply trenched; a substantial road or walk, ten feet in breadth and upwards of one thousand feet in length, has been constructed through the centre of the garden, and the formation of branch walks is contemplated, as circumstances permit. A long slip, on the North side, of newly trenched ground, has also been set apart for an orchard, to meet the constant calls from members for fruit trees. To assist in stocking this orchard, applications have been made to correspondents at Mauritius, Ceylon, Madras, Bombay, the Straits, the Cape, &c. and at various localities on this side of India.

Improvements at Nursery Garden.

In consequence of the very little demand in 1843 for Otaheite and other superior varieties of sugar cane, it was deemed advisable to reduce the cultivation. This has proved unfortunate, in as much, as the calls in 1844 have far exceeded the supply. To meet a probable large demand next season, the Society has appropriated an additional portion of ground for this culture.

Sugar Cane culture.

Large supplies of tobacco seed of the Cuba, Gibali, Latakia and Bhilsa varieties have been gathered and distributed; also guinea grass seed and roots, plants of the pandanus vacoa, morus multicaulis, Mauritius sweet potatoes, Tenasserim yams, &c.

Tobacco Seeds of sorts, Guinea Grass, Pandanus Vacoa, Yams, &c.

In order to admit of an extension of various useful cultures, and to allow of portions of the ground lying fallow, the Society has very lately preferred an application to Government, through Dr. Wallich, Superintendent of the H. C. Botanic Garden, for an additional grant of about 25 begahs of uncultivated ground, situated on the west side of the Nursery, and forming, at present, part of the Botanic Garden.

Application to Government for an extension of Ground.

Here it may not be out of place to allude to the circumstance of a liberal supply (16 cwt.) of Peruvian guano having been placed at the disposal of the Society by W. P. Grant, Esq. A portion of this supply has been devoted to experiments at the garden in comparison with other manures, which are unfavourable to guano; but, under the impression that the relative quantity employed was

Presentation of Guano; experiments with at the garden; and distribution to Members.

not sufficient, further experiments are to be made. The Society has also been distributing some of this stock to members in various parts of the country, on the understanding, that they will communicate, in due course, the result of their experiments.

The Metcalfe Hall.

It was stated in the last report, that the Metcalfe Hall, towards the erection of which the Society had subscribed the sum of 16,000 Rs., was rapidly approaching completion, and would doubtless be fit for occupancy in the early part of 1844. Although the building was completed several months ago, and although the subject of the Society's taking possession of the apartments intended for its use has been frequently alluded to at the monthly meetings during the year, the Society much regrets to add, that there appears to be no immediate prospect of its quitting its present habitation in the Town Hall. At the October meeting, the substance of a letter from the Committee to the builders was read, and a hope was expressed, that the offer therein made, as respects the balance (13,000 Rs.) due to Messrs. Burn and Co. would remove all difficulties. This hope has not been fulfilled. A public subscription has since been commenced by the Metcalfe Hall Committee, and the sum subscribed to the present time amounts to Rs. 4450.

Bust of the late Rev. Dr. Carey.

It was also mentioned in the last report, that the sum of £120 had been remitted to Professor Royle, for the purpose of procuring a marble bust of the late Rev. Dr. William Carey, the founder of the Society. By a communication from that gentleman, received in September, the Society is informed, that he has given the commission to Mr. Lough, one of the leading sculptors of the day.

Formation of two additional Standing Committees.

Besides the business before cursorily alluded to, it may be mentioned, that in consequence of the various questions which have lately come before the Society, connected with foreign and indigenous cereal grasses, and with oils and oil seeds, it has been deemed desirable to form two distinct Committees for the consideration of such matters. These have been incorporated in the list of Standing Committees, under the appellation of the "Grain Committee," and "Committee for Oils and Oil Seeds."

As connected with its literary department, the Society has to report the substitution of a Journal *in parts* for its former *monthly* issue. This change has been brought about in consequence of an insufficiency in the supply of original matter rendering it impracticable for the Committee of Papers to bring out the work with regularity. The Committee have expressed their hope of being able to issue four parts, consisting of about 150 pages each, or one volume, annually; and the Society anticipates that, with the continued assistance of Government, and its own correspondents, and from an arrangement, not yet quite matured, with the kindred institution at Bombay, no difficulty will be experienced by the Committee in fulfilment of this expectation. It may be added, that in addition to Nos. 11 and 12 of volume 2, three parts of vol. 3 have been published during 1844.

Literary Dept.—Journal of the Society.

The Society would take the opportunity, in concluding this brief annual summary of its proceedings, to acknowledge its obligations to its Committee of Papers for their superintendence of the Journal, as also to the Government, and to its correspondents, for the several communications which have been presented and published during the year. To the Government of the N. W. provinces it is indebted for a report by Dr. Wm. Jameson, Superintendent Botanical Gardens, N. W. Provinces, on the cultivation and manufacture of tea in Kemaon; to the Government of Bengal for a series of reports, by Mr. J. O. Price, in reference to the localities in the Dacca and adjoining districts best suited for the cultivation of cotton, and for other correspondence connected with the proposed establishment of experimental cotton farms in that quarter; to Mr. J. W. Masters, for his observations on tea culture in Assam, drawn up at the request of Major Jenkins, and for his remarks on the Assam tea plant in comparison with the tea plant of China; to Mr. John Owen, for his memoranda on the manufacture of black tea, and on the method of collecting opium as practised in Assam; to Major Jenkins, for his hints on the management of the grape vine in an unpropitious soil and climate, &c.; to Mr. R. Ross, Head gardener H. C. Botanic garden, Calcutta, for his remarks on the best mode of propagating plants in India;

Acknowledgment to Committee of Papers and to Correspondents.

to Mr. S. H. Robinson, for his notes on the cultivation of sugar cane in Bengal; to Mr. H. Groom for his hints on the management of certain bulbous flower plants; to Mr. G. Tradescant Lay, for a translation from a Chinese work on the culture of the mulberry tree; to Dr. Alexander Grant, (Bengal Medical service,) for a diary of Chinese husbandry, from observations made at Chusan in 1843-1844; to Dr. W. Griffith for his memorandum on the black dye plant of the Shans, and on the Gutta Percha; and to Mr. L. Wray, for the *second* part of his " Sugar Planters' Companion." In regard to the last mentioned paper, it may be observed, that it has been inserted, in continuous parts, in nearly all the numbers comprising the 2d and 3d volumes of the Journal, and is undoubtedly the longest treatise that has appeared under the auspices of the Society. Besides the above mentioned, the Society is indebted to several of its members for the information supplied by them in connection with the Indian wheat question, and to others, whose communications are published in the correspondence department of the Journal.

Report of the Finance Committee.

At the termination of the year 1844, this Committee have the honor to report the operations of the Agri-Horticultural Society in its *Finance Department*, which for greater facility of reference, they submit in the annexed statements, exhibiting

By No. 1.—The *Total Receipts* from 1st of January to 31st of December 1844, being Co's. Rs. 17,811 : 5 : 2, and the *Disbursements* for the same period, Co's. Rs. 16,220: 4: 3, leaving a balance in favour of the receipts, of Rs. 1,591 : 0: 11, of which Rs. 946 : 9 : 9 is a deposit in the Bank of Bengal, and Rs. 644 : 7 : 2 in the hands of the Government Agent.

By No. 2.—An account current closed to date, from Jas. J. Campbell, Officiating Government Agent, with a Memorandum of Government Securities deposited with him, in accordance with a vote of the Society; the amount thus invested being Rs. 10,433 : 5 : 4.

By No. 3.—A list of the subscriptions in *arrear*, amounting to Rs. 8,730, after deducting the sum of Rs. 416, irrecoverable as per particular account annexed.

By No. 4.—A list of bills payable, amounting to Rs. 2,102 : 6 : 0, and by No. 5.—A Memo. of the liabilities of the Society for 1844, yet to be defrayed, equal to Rs. 920.

It is gratifying to the Committee to be able to state, that although the Society has been subjected to heavy expences for dawk charges on its Journals and letters, in consequence of the withdrawal of the privilege of free postage which had been enjoyed by the Society until 1842, and although its funds have been in requisition for an advance on account of furniture for the Metcalfe Hall, and also to the extent of about 400 Rs. for improvements at the Nursery Garden; yet the accompanying accounts exhibit not only that the cash balance is greater than last year, but that also a considerable reduction has been effected in the liabilities.

The Committee regret that before closing their report, they find it necessary to call the attention of the Society to the arrears for subscriptions still remaining due. These sums now equal about 8,000 Rs, shewing an increase in the amount of this dependency of 2,000 Rs. over last year; but as the degree of success of this institution must chiefly depend upon the amount of pecuniary assistance it receives, the Committee trust, that this intimation of the state of the funds may induce every well-wisher of the Society to come forward with his subscription without further delay.

(Signed) CHARLES HUFFNAGLE,
" M. S. STAUNTON,
Members of Fin. Com. of Agri-Hort. Soc. of India.

Calcutta, December 31, 1844.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India, from 1st January to the 31st December, 1844.

RECEIPTS.

From Members, subscriptions collected during the year, ...		11,920 4 0
,, Government annual donation, ...	1,045 0 0	
,, Ditto, monthly allowance for 12 months at 135 : 13 : 6 per month, ...	1,630 2 0	2,675 2 0
,, Proceeds of a portion of surplus Cape vegetable seeds sold in 1843 and 1844, ...	336 0 0	
,, Ditto, of sugar cane, delivered from the Nursery Garden, ...	530 9 0	
,, Ditto, of copies of the Transactions of the Society, ...	66 0 0	
,, Ditto, of copies of the Journal of the Society, ...	135 13 0	
,, Ditto, of a quantity of Goor sold, ...	49 13 9	
,, Ditto, of Gumlahs, &c. furnished from the Nursery Garden,	2 13 0	
,, W. P. Grant, Esq. as premiums to be awarded during 1845 to the most successful cultivators of Celery, ...	264 0 0	
,, Sir Lawrence Peel, Donation to the Society for the latter half of the year to encourage the culture of flowers, &c. ...	200 0 0	
,, The Ceylon Agricultural Society, being the cost of freight on box of vegetable seeds paid by this Society in 1843, ...	40 0 0	
,, Accruings of interest on fixed assets, ...	422 4 6	2,047 6 3
Total Receipts, Co's. Rs.		16,642 11 3
Balance in the Bank of Bengal on the 31st December, 1843,	946 7 3	
Ditto in the hands of Government Agent on ditto, ...	222 2 8	1,168 9 11
Grand Total Receipts, Co's. Rs.		17,811 5 2

DISBURSEMENTS.

Foreign Vegetable and Flower Seeds.

By C. N. Villet, for Cape Garden seeds, ...	1,342 13 9	
,, Messrs. Landreth and Co. of Philadelphia, for American vegetable and flower seeds, ...	1,603 14 9	
,, Messrs. Vetch and Sons, for English flower seeds, ...	433 [illegible]	
,, Jaun Bux, for Agra Cauliflower seed, ...	36 0 0	

Pandanus Vacoa Seed.

,, T. F. Henley, Esq. for a supply of Pandanus Vacoa seed from Mauritius, ...	18 0 0	

Fruit Trees.

,, Dr. Lamb, for 30 Malda mangoe grafts	30 0 0	3,484 6 4

Society's Transactions.

,, Baptist Mission Press for printing, &c. 500 copies of Volume 8, of the Transactions, ...		1,332 0 0

LIBRARY.

By Books purchased during the year for the Library, ...		152 4 8

PRINTING.

,, Sundry Parties for printing receipts, &c., ...		66 0 0

JOURNAL.

,, Bishop's College Press, for printing Nos. 7 to 12 of Volume 2, and also Part 1 of Volume 3 of the Journal, ...	1,584 6 0	
,, Lithographing Plates for Journal, ...	80 0 0	
,, Ostell and Lepage, for a ream of Paper for Plates for the Journal, ...	10 0 0	
		1,674 6 0

NURSERY GARDEN.

,, Ordinary expences incurred on account of the Nursery Garden, from 1st December 1843 to 30th November 1844, ...	1,903 15 9	
,, Additional expence (in part) for making a walk through the garden, trenching about 15 beegahs of ground, &c. ...	400 0 0	
		2,303 15 9

ESTABLISHMENT.

,, Amount for establishment, from 1st December 1843 to 30th November 1844.		4,301 11 0

MEDALS.

,, Hamilton and Co. for gold and silver medals, ...		342 2 3

PECUNIARY REWARDS.

,, Prizes to Mallees for vegetables and fruits at the exhibitions held on the 13th January, 7th May, and 14th October, ...	347 0 0	
,, Ditto to ditto for flowers at exhibition on the 14th October, ...	100 0 0	
,, The Bhaugulpore Branch Society, annual amount, ...	50 0 0	
,, The Cuttack ditto ditto, ...	50 0 0	
,, Miss Zenut Davy, to defray the cost of manufacturing cloth from certain fibrous plants, as per Resolution of 14th February, ...	100 0 0	
		647 0 0

FURNITURE FOR METCALFE HALL.

,, Messrs. Currie and Co. as an advance for furniture for the Society's apartments, Metcalfe Hall, ...		600 0 0

SUBSCRIPTION.

,, Schramm and LeBlond, a refund for the amount paid by them on account of Mr A. M. Bedier's Subscription to the Society, from 1838 to 1840.		56 0 0

FREIGHT.

,, Freight on boxes of seeds from America, Cape, Bhauglepore, Lucknow, &c.		112 7 6

Advertisements.

By Advertising in the public prints, notices of meetings, distribution of seeds, sugar cane, &c. &c. &c.		320 2 6

Stationery.

,, Stationery for Office books, and for the use of the Office, ...	100 5 0	
,, Ditto eight reams of brown packing Paper for packing seeds, ...	80 0 0	
		180 5 0

Postage and Petty Charges.

,, Postage on the Journal, on letters sent and, received, and for petty expences, ...		640 0 0

Sundries.

,, Custom House duty on 2 cases of English flower seed. ...		4 7 3
Total Disbursements, Co's. Rs.		16,220 4 3
Balance in the Bank of Bengal on the 31st December, 1844, ...	946 9 9	
Ditto in the hands of the Government Agent on ditto, ...	644 7 2	
		1,591 0 11
Grand Total Rupees,		17,811 5 2

MEMORANDUM.

Disbursements.

To Amount of Disbursements during the year 1844, as per statement, ...		16,220 4 3
,, Balance in the Bank of Bengal on the 31st December, 1844, ...	946 9 9	
,, Ditto in the hands of the Government Agent on ditto, ...	644 7 2	
		1,591 0 11
Total, Co's. Rs. ...		17,811 5 2

Liabilities.

Amount due by the Society for expences incurred for printing its Journal, gold and silver medals, English flower bulbs, and for furniture for the Metcalfe Hall, ...	2,102 6 0
Amount for prizes for Vernacular Hand-book of Agriculture, Horticulture, and Farming, and improvement in Indian Churka, ...	920 0 0
Total, Co's. Rs.	3,022 6 0

Receipts.

By amount of Receipts during the year 1844, as per statement, ...		16,642 11 3
,, Balance in the Bank of Bengal on the 31st December, 1843, ...	946 7 3	
,, Ditto in the hands of the Government Agent on ditto, ...	222 2 8	
		1,168 9 11
Total, Co's. Rs....		17,811 5 2

Dependencies.

Amount invested in Government Securities, lodged in the Government Agency Office, ...	10,100 0 0
Amount of Subscription in Arrear, ...	8,557 0 0
Total, Co's. Rs.	18,657 0 0

Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Upper.	Lower.
	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		
Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
30,118	74,0	76,0	73,2	N.	30,078	76,0	81,5	76,0	W.	30,026	77,5	80,8	77,0	W.	30,031	77,0	78,0	76,5	Calm,		
,118	73,0	76,0	72,5	W.	,078	76,0	81,2	77,0	N. W.	,021	77,7	82,0	78,5	N.	,026	77,8	78,4	76,9	N. W.		
,130	73,8	77,0	74,0	N.	,082	76,5	81,0	76,6	N.	,006	78,8	82,4	79,0	W.	,009	78,0	78,5	77,0	N. W.		
,114	74,4	76,8	74,0	N. W.	,073	77,0	81,8	77,0	N. W.	29,990	78,0	82,0	78,2	N. W.	29,998	77,8	78,7	76,4	N. W.		
,124	74,8	76,0	74,4	N.	,078	77,0	81,0	77,4	E.	30,010	78,9	82,6	78,6	N. E.	30,016	78,4	78,8	77,0	Calm,		
,150	74,5	77,0	76,0	W.	,102	77,0	81,7	80,5	N.	,042	78,8	81,8	78,8	N.	,050	78,4	78,4	76,0	N. W.		
,165	74,0	76,8	73,0	N. E.	,130	77,0	80,0	75,0	N.	,062	78,4	80,4	76,5	N. W.	,070	78,0	77,0	75,0	N.		
,182	71,4	76,0	71,0	N. E.	,153	74,5	80,4	75,0	N. E.	,081	75,5	79,0	74,8	N.	,090	75,4	76,0	73,0	N.		
,185	71,8	73,9	69,8	N.	,141	74,0	78,8	73,8	N. W.	,065	75,5	80,0	74,8	N. W.	,070	75,5	76,0	73,0	N. W.		
,161	71,0	73,5	69,0	N.	,105	73,5	79,0	73,8	N.	,042	76,4	78,7	74,0	N.	,050	76,0	76,0	72,8	N.		
,197	71,1	74,0	69,8	N.	,170	75,0	77,0	72,8	N.	,085	76,5	78,5	75,0	N.	,093	76,2	76,0	74,4	N.		
,224	68,5	71,9	68,0	N. (sharp)	,190	73,0	76,5	71,5	N.	,110	74,4	76,7	72,6	N.	,121	74,0	74,0	70,5	N.		
,214	68,0	70,3	66,0	N. (sharp)	,181	72,5	76,0	71,5	N. E.	,105	75,0	78,4	74,0	N.	,110	74,5	74,4	72,5	N.		
,185	67,5	70,0	68,0	N.	,137	72,5	74,4	72,2	E.	,078	74,5	79,0	74,5	W.	,086	74,8	74,4	70,9	Calm,		
,141	69,2	74,0	70,0	E.	,105	71,9	77,0	72,0	N.	,026	73,8	78,3	73,8	N.	,034	73,9	75,0	72,7	N.		
,094	69,4	69,8	68,5	N. E.	,049	72,9	78,0	73,0	N. W.*	29,986	75,4	80,0	74,8	N.	29,989	75,5	76,0	74,0	Calm,		
,122	70,0	73,8	70,0	N. E.	,078	73,6	78,4	73,0	N.	30,013	76,4	79,4	74,0	N.	30,014	75,6	76,0	73,0	Calm,		
,149	71,0	74,0	69,8	N. E.	,121	74,4	78,5	72,0	N.	,054	76,0	79,8	74,0	N.	,054	75,0	76,0	72,5	Calm.		
,178	70,5	72,4	68,0	N. E.	,149	73,4	76,4	70,1	N.	,082	75,4	78,0	72,0	N. E.	,085	74,4	74,0	70,8	Calm.		
,170	68,5	72,4	67,0	N. E.	,137	72,0	76,5	69,4	N. E.	,066	74,0	79,0	70,0	N. W.	,074	73,8	72,5	68,0	N.		
,150	68,0	72,0	65,8	N.	,109	71,0	75,5	68,0	N. (sharp)	,034	73,0	76,0	70,5	N. W.	,037	72,8	72,0	67,8	N.		
,154	66,0	70,0	65,4	N.	,109	69,4	74,4	67,8	N.	,041	72,0	75,0	68,0	N. W.	,048	71,5	70,4	68,0	N. W.		
,162	66,3	69,5	66,0	N.	,197	70,4	76,0	72,0	N. E.	,082	72,5	76,0	72,8	N. W.	,086	72,0	72,0	71,8	W.		
,133	65,4	69,8	66,0	N. E.	,093	69,8	76,2	70,0	N. W.	,017	73,0	78,0	73,8	W.	,022	72,8	73,0	71,9	W.		
,265	67,0	68,0	66,0	N.	,241	69,4	70,7	68,6	N.	,194	71,5	76,0	72,5	N. E.	,200	71,5	72,2	70,8	Calm.		
,289	67,4	72,0	70,0	N.	,248	71,2	76,5	71,8	N.	,193	74,0	80,0	75,0	N.	,202	73,6	76,0	73,3	Calm.		
,253	69,1	73,4	70,0	N. E.	,217	72,0	78,0	73,5	N. E.	,145	74,2	80,0	75,0	N.	,150	74,0	76,7	73,2	Calm.		
,225	69,0	70,0	70,0	N. E.	,170	72,0	74,0	71,5	N. E.	,100	75,0	82,2	76,0	W.	,106	74,0	75,0	74,5	Calm.		
,189	70,0	68,5	68,5	N. W.	,138	73,0	75,0	72,5	S. W.	,065	75,0	82,3	75,0	S. W.	,080	75,0	77,0	75,2	Calm.		
30,173	70,2	72,9	69,1		30,131	73,4	77,6	72,9		30,063	75,4	79,0	74,6		30.066	75,2	75,5	73,1			

N. B. The Observations marked with Asterisks, signifying that clouds intervened at the time, are not included in the mean 99, 6°.

Barometer by Troughton used prior to the 1st June 1844. Observations reduced to 32° Ft. = 29 493
" by Col. Everest used from 1st June to 31st August, ... Ditto .... = 29 687

Correspondence and Selections.

WHEAT AND BARLEY CULTIVATION IN UPPER INDIA.

Extract of a Letter from H. HAMILTON BELL, *Esq., dated Omeghur, near Agra, 2nd October,* 1844.

I was about to address you, (when your Deputy Secretary's letter of the 16th instant arrived,) to notice the result of the trial made with the Indian corn seed you were obliging enough to transmit me, and I regret to say, my report must be unfavourable. I had it very carefully cultivated in several villages, and directed, that in each case it should be sown when the contiguous *kaits* on each side were under a similar caltivation of native seed. In no instance was the foreign plant nearly equally luxuriant, and the kinds of corn are universally smaller and less productive. I have picked out a few of the best for a second trial; but as yet I see no inducement to the introduction of this foreign grain.

I have the pleasure to enclose a statement of the produce of wheat and barley from several villages, more or less under my controul, so that I can vouch for the returns as correct. I have made the returns in bushels per acre, in an allowance of 60lbs. for wheat and 50lbs. for barley per bushel, and this is above the English average, I should think at least 4 per cent.

In looking at this report, you will be good enough to bear in mind, that the wheat crop of this season suffered extremely from an insect, here termed *ruttooa,* and the injury was asserted by the natives to exceed one-third of the produce. I am disposed to think this not much, if at all, exaggerated. The barley on the other hand was generally a very good crop, the insect scarcely touching this, and never if there were contiguous wheat *kaits;* though the latter might suffer extremely. There was no other selection of the kaits than those close to the villages, as the richest and best; and those near the boundaries, generally the most cultivated, were avoided. To this indeed there was one exception in a *kait* of barley in

the village of Dugna, especially selected from its very promising appearance, and this gave the immense return of 100 bushels per acre. I do not think any of the land in the list pays a higher rent than 1-8 per bigah=to about 15*s.* sterling per acre.

I shall have great pleasure in trying the seed you mention as having been forwarded, and have duly noticed Mr. Haworth's report on the several qualities of the wheat received from Colonel Ouseley. I do not perfectly perceive the advantage of its introduction, as two of the descriptions made neither good flour nor good bread ; but at all events will give it a trial.

I will endeavour to obtain some information respecting the white linseed. I have never seen nor heard of it ; but if grown in this part of the country, I will obtain such details as I can for your information.

Return of Produce in Wheat and Barley per Acre, in bushels of 60*lbs. and* 50*lbs. weight respectively, in the undermentioned villages.—Rubbee Crop of* 1843-44.

Zillah and Pergunnah.	Villages.	Bigahs of Wheat.	Bushels of 60lbs. per Acre.	Bigahs of Barley.	Bushels of 50lbs per Acre.
MUTTRA, JELASUR, ...	Ramghur, ..	5	27	3	55
	Ditto, ...	0	0	3	$53\frac{16}{50}$
	Ditto, ...	0	0	5	30
	Sonat, ...	4	25	7	$32\frac{1}{2}$
	Ditto, ...	5	$16\frac{4}{5}$	0	0
	Mohimpoor,	11	$16\frac{4}{5}$	$2\frac{1}{2}$	32
	Rettenhi, ...	10	$22\frac{1}{2}$	0	0
	Rajpoor, ...	14	$29\frac{3}{4}$	15	50
	Raimgah, ...	25	$25\frac{1}{3}$	3	$86\frac{1}{3}$
	Kyrghur, ...	5	$29\frac{1}{6}$	5	50
MYAPOORIE, SHEKONBAD,	Ditto, ...	5	$27\frac{1}{2}$	0	0
	Ditto, ...	11	$25\frac{1}{3}$	0	0
	Dugna,......	10	$33\frac{1}{3}$	4	100
	Correi, ...	7	$44\frac{1}{2}$	0	0
	Libowa, ...	11	$32\frac{1}{2}$	0	0
	Haturut, ...	10	25	0	0
	Darsouhi, ...	7	25	0	0
AGRA, FIROZABAD, ...	Jerrouh, ...	5	$29\frac{1}{6}$	5	50
	Simla, ...	7	$23\frac{3}{4}$	0	0

The rubbee besides suffering from the *ruttooah*, as noticed in my letter, was unproductive from the dry parching winds near the time of its maturity. Generally it was an unfavorable wheat, but very good barley crop. On a variety of returns, the result was superior to the above, but I cannot entirely depend on them.

PROGRESS OF VARIOUS CULTURES IN THE LUCKNOW HORTICULTURAL GARDEN.

Extract of a Letter from Capt. G. E. HOLLINGS, *dated Lucknow, 30th August,* 1844.

Although I have not written to you for sometime, you must not suppose that my anxiety to contribute to the objects of the Society has in the slightest degree abated. I have had many things to attend to, and want of leisure is the only rational excuse I have to offer. With regard to the garden, every experiment has been far more successful than I could have anticipated, and now that I have acquired some practical knowledge, and succeeded in getting the establishment into good working order, I trust that I shall be able to be far more useful than I have hitherto been. Lest I should forget it, I think it right to mention here, that I particularly wish you to send me seeds of all vegetables you may receive from England or the Cape, tulip and other flower bulbs, dalias, &c. &c. I should be glad to receive small supplies of vegetable seeds by letter dâk. Having said what I want, I will give you an account of our proceedings.

The fruit season was very favorable, and productive of a great addition to our resources. The vines, peach and mangoe trees yielded a handsome return; all the grafts of oranges, citrons, lemons, guavas, apricots, &c., succeeded. The cereal grains and vegetables were finer than have ever been raised in the garden. Senna, ginger, and tobacco failed in a great degree, but I hope to be more successful this year. Of the crops now in the ground, the sugar-cane has been greatly injured by white ants, but the plants that have escaped promise well. The cotton plantation is in excellent order, some of the shrubs are in full blossom, and seem to be in the most thriving condition. The maize from the American seed you

kindly forwarded, has been very good.* Every article in the khureef, or autumn crop, is thriving. There never has been within the memory of man, a more favorable rainy season than the present.

All the vines raised from the seed given to me by Sir William Nott, are alive, but very stunted in their growth. I have a seedling planted in the open air in April last, from the grapes sent from Cabool in boxes packed in cotton, which has attained the length of more than eight feet, and all of those seeds which were planted with the fruit entire, but too much decayed to be eaten with relish, have become large and handsome trees. I should like to hear the result of similar experiments in other parts of India. My idea is, that if the whole fruit is grown, instead of only the seed, the decaying portions of it, according to the principle of Liebig's system, afford the best manure.

With the expectation that an enquiry into the causes may lead to useful result, I deem it right to mention, that with the view of astonishing the lieges on some grand occasion, with vegetables quite out of season, I put some peas, pods and all, into one of the ice pits: they were brought to me about a month ago, the box in which they were packed with other vegetables had been stove in. The potatoes and cauliflowers were destroyed; the cabbages were apparently in good order, and the peas were sprouting. I had them placed in the ground, and to the present writing, they are thriving, and promise to yield us an early crop. They were sown on an elevated bit of ground where no water could lodge. Some peas that had not been in the ice were planted at the same time, and have come up splendidly, as also a crop of potatoes. I will let you know how the experiment eventually succeeds, and when we first get peas and potatoes.

* The soil and climate of Lucknow would thus appear to be better adapted for the American maize than that of Agra. A like success has attended the trials of Mr. C. B. Taylor at Rajharra, in the Palamow district; for in a letter under date 28th September, he writes, "The American maize has succeeded well, I have obtained a large quantity of the corn from what you sent me, and next year will be able to cultivate a few fields, and to supply the people in this part of the country with seed. I have had many applications for it, but could only satisfy a few." From Capt. Dunlop's letter, at page 199, it will be seen that the foreign maize has also thriven well in the Cuttack Branch Society's Garden.

We had a very fair specimen of vegetable marrow two days ago, and the asparagus this year has been by far the finest raised at Lucknow.

Your questions about hemp are not forgotten; the fact is, that in Oude, the plant is principally used to produce the drug called *subjee* or *bhang*, and there are other fibrous plants from which rope is made. The common hemp grows in the greatest luxuriance throughout the whole tract of country situated beyond the Gogra.

It is intended to make forcing beds for cuttings and seeds, and I hope to be able to make some successful experiments for raising early melons, cucumbers, &c.

The plan mentioned in the last (August) report of the Society's proceedings for raising cauliflowers, is that which has always been adopted at Lucknow, namely, taking off the lower leaves and earthing up the stalks. I intend to try the effect of bone dust as manure this year.

We have beds prepared for celery in the same way as for asparagus, by digging trenches three feet deep, laying down manure, and earthing up.

Can any one tell how mushrooms ought to be cultivated in India?

English primroses, clove pinks, China pinks, rose Edwards, tuberoses, lilies, and all the most handsome Indian shrubs are at present in magnificent blossom. My dahlias look healthy, and have sprung to a great height, but there is no appearance of blossom yet.

In one of my first communications I mentioned, that I thought I had succeeded in propagating the teak by slips. I was mistaken, for all the cuttings eventually failed; but I have some that were put into the ground in March last, which have sent out shoots, and therefore I hope, although not without a considerable degree of doubt, that I have had better luck this time.

Several of the carnations that I raised from English seed last year are thriving admirably. I have done all in my power to meet the wishes of those who have asked for seeds this year, I hope that in every succeeding season my means will be increased, and our arrangements improved, until the grand objects of the Society are fully accomplished.

On reperusing my letter I find, that I have mentioned the results from keeping certain vegetables in ice, but have omitted to notice the effect of an exactly opposite cause, namely intense heat. When the house in which I was residing, a large puckah one, was destroyed by fire on the 20th April last, many of the trees in the garden, especially in that part of it which is between my house and the one occupied by the Reverend Mr. Garbett, were severely scorched. A row of mulberry trees in all probability saved Captain Shakespeare's house, which is nearer to mine than either Mr. Garbett's or the church, which were both destroyed. It is a curious fact, that with exception of a cactus, there was not a single tree or shrub destroyed by the intense heat and flame. The bamboo frame on which a honeysuckle rested was burnt, and the plant consumed to within two feet of the ground. All the mulberry trees had some branches scorched. In fact after the fire, all that had been green and flourishing, appeared brown and burnt up. But now whether trees or shrubs, those that apparently had been more injured by the fire, are now throwing out the strongest shoots, and the oldest trees are looking young again. The honeysuckle has assumed a far more healthy appearance than it ever bore before.

If any person unacquainted with the Hindostanee language, produces a good practical work on gardening in India, I shall be happy to undertake the translation into Ordoo, if no more competent person offers to do it.

2d October, 1844.

This letter was not sent to the post office as I expected it would have been, on the 31st August, and has been mislaid ever since. The first crop of peas has failed since the rains ceased. A few plants from those that were preserved in ice are alive and in blossom. The teak cuttings have also failed.

Result of Experiments at Cuttack, on Seeds procured from the Society.

To the Secretary of the Agri-Horticultural Society of India, Calcutta.

Dear Sir,—With reference to your letters of the 26th April and 16th July, I have the honor to report upon the seeds forwarded for the Branch Garden at Cuttack.

The Sea Island, Upland Georgia, and acclimated Bourbon Cotton seeds sown 15th August and 15th September, have been complete failures, not a seed having vegetated. The New Orleans, $\frac{N.O}{B}$ and $\frac{N.O}{R}$ have come up, and are in healthy condition.

Of the American maize seeds, the prolific and white flint corns turned out very fine crops; one head of the latter contained 620 grains, and weighed without the husk 25½ rupees. The sugar-cane, white and yellow gourd and tuscorora likewise turned out well, but far inferior to the two first mentioned kinds. A considerable quantity of these seeds have been distributed throughout the district, through the kind medium of Messrs. Mills, Cardew, Brownlow, Gilmore and Trevor.

All the cabbage seed failed, but I was prepared for disappointment here, as you mentioned in your letter you could not speak for the soundness of the Cape seed you sent me, (being the remnant of last year's stock.)

The Bilsa, Cuba, and Gibali tobacco seeds are very fresh, and I expect a fine crop. Colonel Garnault has presented the Society with some Persian seed, which I expect will produce tobacco of a superior flavour.

The Tennevelly senna is now above ground, but the seed did not vegetate freely.

I have as yet only tried the munjeet in a gumlah, but none of the seed sown has vegetated, and I fear the soil of the garden here will not answer for its cultivation, however it shall have a fair trial.

From England and the Island of Vido in the Mediterranean, I have lately procured some fuchsia fulgens, potentilla, callomea coccinea, iris, and pelargonium seeds, which have been sown in gumlahs, and are mostly doing well.

I believe the Parent Society presents fifty rupees and two silver Medals to its Branch Societies: if so, I should feel greatly obliged if you would kindly take the trouble to get them for this Society.

I am, &c.

W. W. Dunlop,

Cuttack, 25*th Sept.* 1844. *Secretary, Cuttack Branch Society.*

Observations upon the Corn Weevil, contained in a Letter addressed to the Rev. F. W. Hope, *F.R.S., Pres. E.S., &c. By* William Mills, *Esq., F.L.S., &c.*

I spent from the month of January till August this year (1835) in Madeira with my friend Lord Vernon, with whom I went out in his yacht, the *Harlequin*, and I had an opportunity of observing a good deal upon the Weevil, (*Calandra granaria*). What the progress of the annual laying of the egg in common wheat is, I am not quite prepared to say, as Shaw declares that the female perforates a grain of wheat and lays its eggs; but I am inclined to differ with him in that; and in regard to Indian corn, I am pretty certain that the animal lays its egg in the blossom, and that the corn is formed with the egg in the heart. I examined very many grains for several days, and most minutely, with a microscope, and could discover no signs of perforation anywhere, although the chrysalis was evidently there in the centre of the grain. I then cut the grain open, took the chrysalis out, but could discover no wound of any nature in the corn itself by which it could have been lodged from without: this happened so continually, that it leads me to suppose that it must have been deposited during blossom. I then tried at what heat I could hatch them, and I found 110° Fahrenheit succeeded, whilst from 130° to 140° of heat kills them. A gentleman of the name of Wilkinson, in Maderia, has now established a heated room with hot water pipes, in which he receives as many as 800 bags of wheat at a time; these become heated through at about 135°, and the wheat, when resifted, is perfectly cleansed from these noxious insects, and makes quite as good bread as before. I also tried some of it in the ground that had been subjected to this heat, and it came up. It is very possible I may not have communicated anything very new to you, but which, if such be the case, I am sure you will excuse. An old medical gentleman assured me that he considered the wings and crustaceous parts of the Weevils so heating to the system, as to be almost as injurious as cantharides taken internally on a slow scale. And when we consider the quantity of bread which is imbuded with them in warm climates, it is decidedly worth attending to for the sake of a purer food. I am aware that weevils, when once brought amongst corn, continue to breed by laying the egg in wheat. But how do they first get there at all? Nature has supplied them with wings, so that the reaching of the blossom for the purpose of laying the egg is perfectly attainable to them. In almost all the instances I have alluded to, the insect was

in the heart, and the *farina* formed all round it without a wound of any nature. Amongst rice and other grain I believe them to be communicated entirely in store, or in a ship, which amounts to the same thing.—*Transactions of the Entomological Society.*

Of fertilizing the Soil by means of Manures.

The great object for which farming *ought* to be pursued, whether in pastoral or arable districts, is increase to the fertility of the soil. The object, however, commonly kept in view in cultivating the soil, is constantly to derive the largest amount of produce from it. Though these two ends are diametrically opposed, as regards the condition of the soil, enlarged crops cannot be obtained but from increased fertility. Strange to say, that this truth seems only to have been discovered lately, and it is its adoption now as a rule of practice that constitutes the great difference between the agriculture of the present day, and that of former years. Not many years ago, cultivators were so irrational as to believe that they might continue to reap bulky and weighty vegetable crops from the soil, without having to return to it an equal weight of vegetable matter. Their practice implied the belief, that a virtue naturally exists in the soil, which enables it to yield crops out of its abundance; and the belief certainly receives support from the fact of soils of natural fertility yielding largely with very inadequate culture; and such a belief is naturally clung to with great tenacity by farmers who cannot conceal from themselves the mortifying fact, that the ordinary resources of ordinary farms are unable to afford a return of as much matter in support of the soil, as the weight of the crop obtained from it. To make up for the deficiency, many expedients are resorted to,—such as bare-fallows, changes of rotation, lime, and at length draining, which are all tried in succession and in co-operation, in order to sustain the soil in good heart; but useful as all these auxiliaries are, they are found to be no substitutes for the one indispensable source of fertility—*farm-yard manure.* It is admitted, on all hands, that without this manure, or some equivalent, if such there be, it is impossible for the soil to continue, for a series of years, to yield abundant crops; and it should also be admitted, that where the soil is not manured to the degree to call forth its *best* energies, a large amount, both of time and produce, is lost by a state of cultivation which is inefficient.

It was, and still is, a very natural desire in the farmer to be able to conduct his farm upon its own resources. True, he carries off to market a great weight of its produce every year; but it is equally true that

the farm is, as it were, a field of creation,—where is raised every year what never existed elsewhere before. There is no unreasonableness in the supposition at first, that the application of all the disposable manure of the farm, together with skilful culture, might sustain, or even increase the fertility of a portion of its soil. It is easy to suppose, that, in addition to manure, skilful culture on exposing the soil to the atmosphere, by the action of the plough, the harrow, and the roller, may tend to increase its fertility by pulverisation; because observation affirms, that where the *natural* productions of the soil are most luxuriant, the soil is deep, and in a pulverised state. It is easy to conceive, when the soil is thus exposed by mechanical means, that a mutual chemical reaction takes effect between its constituents and the component parts of the air; and that the influence of rain, and heat, and light, may so alter the tone of the soil, imparted by the last crop, as to render it better for a succeeding one. It is easy to imagine, that, when superfluous water on land in winter is provided with channels, through which to flow away easily, and not remain to consolidate, refrigerate, and acidify the soil, that the soil will become warmer, more easily pulverised, and more congenial to vegetation. With all these means of melioration, and with experienced skill, conjoined with the enriching quality of every animal and vegetable manure available, together with such a rotation of cropping as to render those means effective to the greatest degree; it is, I say, very natural in farmers to expect the soil, in such circumstances, to yield an increased produce. Yet, after all, melancholy experience has shewn the unreasonableness of the expectation, and has proved, beyond doubt, that no farm is able to *sustain* the fertility of its soil by its own resources, far less to *increase* it. The disclosure is useful, because, though disheartening, it has not dissuaded the farmer going in quest of assistance, nor has a knowledge of his wants deterred others presenting to his notice an almost innumerable host of succedanea. The difficulty with him now is, in choosing from among these what is really a useful manure.

Before directing our attention to any of the substitutes for farmyard dung, which are now-a-days so rife, let us consider, in the first place, the extent of the resources which a farm of mixed husbandry possesses in supplying itself with manure; and to forming a just estimate of this inquiry, I regret to say, little information is to be found on which much reliance can be placed. It is a species of information, however, worthy of being ascertained by experiment on every class of soil, and in every system of husbandry.

Resources of the Farm.—The entire resources of a farm consists of the straw of the grain crops, all the green crops, whether of forage, tubers, or bulbs, all the grass and hay, all the dung of animals, whether confined in the steading, or at large in the fields, all the weeds picked off the fields, and every other refuse, such as coarse grasses, scourings of ditches, &c. Now, on looking at (1970.), it will be found from data adduced there, that a return of 1 ton of straw per imperial acre, at an average, from all the crops usually cultivated, is above the mark for Scotland. The English authorities, Arthur Young and Mr. Middleton, estimated the average at from 1 ton 7 cwt. to 1 ton 5 cwt. per imperial acre. The late Dr. Coventry estimated the average for Scotland at 1 ton 1 cwt. Judging from the produce in the neighbourhood of Edinburgh, I should say that 1 ton per acre was quite high enough an estimate for Scotland. Taking 1 ton as the average, the question is, what quantity of muck will this afford? and in considering this question you should remember, that, in the system of husbandry adopted for illustration, 200 acres are every year in corn, 200 acres in grass, and 100 acres in fallow. So that the whole dry straw of a farm of 500 acres would only weigh 200 tons. Dr. Coventry estimates it as probable, that straw, after it has been wetted by the dung and urine of animals in courts and stables, and by the rain that may have fallen upon it, will weigh four times more than in the dry state; but that wet litter is reduced $\frac{1}{3}$ of its weight by fermentation before it is applied to the soil in the shape of manure. The other $\frac{2}{3}$, together with the pulse crops, as pease and beans, and the refuse of the corn crops, such as chaff, &c., he supposes may supply 4 tons of manure from every acre of straw, or 800 tons in all. Supposing the hay crop to weigh $1\frac{1}{2}$ ton per acre, and treated in the same manner as fodder-straw, will afford 6 tons per acre of manure, which over 20 acres of hay, will afford 120 tons of manure. The moist part of the turnip crop may be considered as computed in the additional weight acquired by the dry straw, after the turnips have been used by the live-stock in the courts and stables, still the firm portion of the crop will yield a great return, and besides improve the quality of the entire bulk of manure. Supposing that 24 tons is a fair crop of turnips per acre, and that $\frac{1}{4}$ of this is available for manure, 6 tons per acre will be derived from this source, as assumed by Dr. Coventry, and if there are 69 acres of turnips, the dunghill will be increased in weight, if not in bulk, by this means, to the extent of 414 tons.* These are the chief resources of available manure on the

* Coventry's Notes on the Culture and Cropping of Arable Land, p. 21.

farm, and they afford an aggregate of 1334 tons, which at 15 cwt. per cart-load, gives about 1778 loads of dung. Of these, the potatoes require 20 loads per acre (2411.), 15 acres = 300 loads. The 69 acres of turnips, according to the dunging specified in (2500.), would be divided into 30 acres of Swedes, at 20 loads per acre = 600 loads; 10 acres of yellow, at 16 loads = 160 loads; and 29 acres of white, at 13 loads = 377 loads, in all for green crop 1437 loads; and as 10 acres of bare fallow and 6 acres of tares have to be dunged, which at the least will require 16 loads per acre, 256 loads will be required for this purpose (2824.). This calculation leaves 85 loads over after dunging the fallow division to an ordinary degree.

I suspect that the quantity of manure derived from the farm, as I have just stated it, and which is founded on the data furnished by Dr. Coventry, gives too favourable a view of the farm, and is not in conformity with the experience of most farmers. I remember when in Berwickshire, on a farm of near 700 acres of land of good stamina for corn, no manure was ever bought for it. It was farmed on the 5-course shift, the fallow-break comprehending 130 acres, and about 90 stacks of 15 feet diameter used to be built within and without the stackyard in a good season. Though the turnips, occupying about 80 acres, were well dunged, keeping in view that a part were to be eaten off by sheep, I must own that the bare-fallow-break, consisting commonly of 40 acres, the remaining 10 being in potatoes and tares, were but lightly manured; and, no doubt, had manure been as plenty as is represented above, the bare-fallow land would have received more than it did. To sustain the stamina of the land, what was bare-fallowed in one course was made to bear turnips in the next. I may mention, in explanation of the circumstances I have stated regarding this farm, that it was situate 10 miles from the market town, and neither bone-dust, nor any such manure, was in vogue in those days. With the facilities now existing for obtaining manure, farmers may conduct their rotations with comparative ease, and as they please. On a 300 acre farm of turnip-land in Forfarshire under a 5-course shift, which I referred to in the rotation of cropping light lands, I could not, for the first few years, manure from its own resources more than 30 acres of the fallow-break of 60 acres; and even after 8 years of improving culture, the quantity never exceeded 40 acres, the remaining 20 acres being dunged with extraneous manure, partly with bone-dust and partly with cows'-dung purchased at 5s. per ton, or 7s. the double-horse load. So great is the diversity of results obtained by farmers in regard to the proportion which the straw really bears to the crop, that little reliance, I fear, can

be placed on Dr. Coventry's estimate, as one for general application, even though we should be made acquainted with the premises from which he drew his conclusions. A limited experiment would afford no satisfactory results on this subject. By way of illustration, I may just mention the result of some experiments which were tried by Colonel Le Couteur with 4 different sorts of wheat with a view to ascertaining the quantity of straw afforded by each, and he obtained these very different results under the same circumstances; viz:—

	Bu.		lb.		Straw.
The White Downy, yielded	48	and	4557	of straw	= 95 lb. per bushel.
.... Jersey Danzig, ...	43½	....	4681	....	= 107 ....
.... Whittington, ...	33	....	7786	....	= 236 ....
.... Belle Vue Talavera,	52	....	5480	....	= 105½ ....*

The quantity of straw to the bushel in the Jersey Danzig and Belle Vue Talavera is nearly the same, though the gross amount of produce, which is the source of manure, is very much in favour of the latter; while with the other two varieties of wheat, the quantities are very dissimilar and disproportioned, both of grain and straw; and on taking the gross weight both of grain and straw, the diversities and disproportions are just as great, thus:—

	lb.		lb.	
Of White Downy, the grain weighs	2976,	the straw	4557	= little more than ½ times.
.... Jersey Danzig, ...	2740,	....	4681	= .... $\frac{2}{3}$ ..
.... Whittington, ...	2013,	....	7786	= .... $3\frac{5}{6}$ ..
.... Belle Vue Talavera, ..	3172,	....	5480	= .... 1½ ..

It is clear, therefore, that any results on this subject that should command general credence are yet to be derived from experiments conducted on a large scale throughout the country.

Farm-yard dung.—The acknowledged universal applicability of farm-yard dung to every other article of the kind, may arise from its very complex composition affording nourishment to every kind of plant raised on the farm. It is a compound of straw of various kinds of horse-dung, cattle-dung, pigs'-dung, of the urine of those animals, of whatever dung the poultry may have dropped in their peregrinations through the different court-yards, and of rain-water, but of the sorts of dung, much the largest proportion consists of that of cattle. Analyses, I believe, have been made of farm-yard dung, in the state it is applied to the land, but as portions vary in composition, according to the

* Journal of the Royal Agricultural Society of England, vol. I, p. 123.

proportion of the different sorts of dung and urine it contains, it will be more satisfactory to give the analysis of each component part, than of the whole together, though it is the aggregate which plays the important part in the economy of a dunghill. Of the various constituents of straw you have already been made acquainted, in (1965.) and (1966.)

The composition of cattle and horses' dung and urine is as follows:—

COWS' DUNG.

	Hailden.
Phosphate of lime, ...	10.9
———— magnesia, ...	10.0
Perphosphate of iron, ...	8.5
Lime, ...	1.5
Gypsum, ...	3.1
Chloride of potassium, / ———— copper, }	traces.
Silica, ...	63.7
Loss, ...	1.3
	100.0

COWS' URINE.

	Brande.
Chloride of potassium and sal-ammonia, ...	15.
Sulphate of potash, ...	6.
Carbonate of potash, ...	4.
———— lime, ...	3.
Urea, ...	4.
Water, ...	650.
	682.

HORSES' DUNG.

	Jackson.
Phosphate of lime, ...	5.00
Carbonate of lime, ...	18.75
Phosphate of magnesia, ...	36.25
Silica, ...	40.00
	100.00

HORSES' URINE.

	Vauquelin.
Carbonate of lime, ...	11.
———— soda, ...	9.
Hippurate of soda, ...	24.
Chloride of potassium, ...	9.
Urea, ...	7.
Water, ...	940.
	1000.

I am not aware of any analysis of pigs'-dung, but Sprengel examined pig's urine, when the animal was fed on corn offal, and found it to consist of—

Water, ...	92,600 in 100,000 parts.		
Urea, with very little mucus, albumen, and colouring matter, ...	5,640	..	..
Salts, as common salts, muriate of potash, gypsum, carbonate of lime, and sulphate of soda.	1,760	..	..
	100,000*		

Of the origin of all these substances in the urine and dung of animals, and of the use of them as a manure to the soil, Liebig thus expresses himself in his own peculiar manner: "It has been shewn," he says, "by

* Journal of the Royal Agricultural Society of England, vol. 1, p. 492.

an examination of fæces and of urine, that the mineral ingredients of the food—the alkalis, salts and silica—are eliminated in these excrements. Urine contains all the soluble mineral substances of the food, while the fæces contain the ingredients insoluble in water. As the food is burned in the body just as it would be in a fire-place, the urine may be said to contain the soluble salts of the ashes, and the fæces the insoluble salts. These analyses shew, as nearly as can be expected from experiments of this kind, that all the constituents of the ashes of the food are again obtained, without alteration, in the solid and liquid excrements of the horse and cow. The action produced upon our fields by the liquid and solid excrements of animals ceases to be mysterious or enigmatical, as soon as we have attained a knowledge of their mode of origin."* Here, then, a mutual reproduction goes on between the food and the dung of animals; whatever ingredients animals consume in their food, those only they can and do void by their dung and urine, and these again constitute the best manure for raising the food upon which the animals feed. It follows that the ingredients afforded by straw, hay, turnips, and potatoes, are voided as dung and urine by the animals which feed upon them, and that the dung derived from them makes the best manure for raising the same crops. It follows also, that the farm itself is the best source of the manure that should be applied upon it. Also, that could the whole food consumed on the farm be returned again to the soil, in the shape of dung and urine, it will continue to yield without diminution; but this is impracticable, because the animals which are fed, take away, in increased size of body, and the animals wrought, in muscular energy, much of the ingredients of the food they consume, so that the soil must be supplied with manure from other sources to be able to sustain its fertility, and much more so to increase it. This conclusion, which reasoning may have arrived at, is that derived from experience.

Assuming this to be the best general theory that can be given of the source of manure for a farm, we may make the same remark which Professor Johnston does, when speaking of the particular crops of a rotation: "It may be said that this explanation seems to imply that the same kind of crop may be reaped from the same soil for an indefinite number of years, by simply adding to it what the crop carries off. This is certainly implied in the principle; and *if we knew exactly what to add for each crop*, we might possibly attain this result, except in cases where the soil undergoes some gradual chemical alteration within itself,

* Liebig's Chemistry, in its application to Agriculture and Physiology, p. 176. Edition of 1843.

which it may require a change of treatment to counteract."* In connection with this view of the subject, practice appropriates the several sorts of dung in a determinate way. For example, horse-dung is preferred for potatoes, cow-dung for turnips, and care is taken not to apply pig-dung to potatoes, as it will inevitably impart a strong disagreeable taste to them.

Farm-yard dung is always applied in Scotland to the soil when it is under the operation of the plough, that is, it is always buried *under* a portion of the soil; and the object of this treatment is to secure all its volatile ingredients, as well as its more solid constituents. In England, however, it is extensively employed in top-dressing old meadow-land, which is made to produce hay every year; and, no doubt, if well fermented, and applied in moist weather, the soil will derive much benefit from it, and some such application is necessary, when the entire produce of the grass is carried off, as is the case with the hay crop. But it cannot admit of doubt that this practice occasions much waste of manure; very much of its volatile part must be dissipated, and much of its solid part dried by wind and heat. The practice is indicative of bad farming, for two reasons which ought to be conclusive with a good farmer. The first, as I have already stated, is the waste, to whatever extent, of valuable manure which it occasions; and the other reason is, that as old meadow-land is not included in the rotation of the rest of the farm, the manure it receives is so far a robbery of the arable farm, while it may return no manure at all, as all the hay may be sold and carried off. The rotation usually followed in England, in conjunction with old meadow-land, is, as I have already mentioned in the preceding section, the 4-course shift, a course which it is impossible to uphold on any farm without the assistance of extraneous manure. It is evident, therefore, that top-dressing old meadow-land with farm-yard dung from another portion of the farm which is in a different course of management, is a scourging system for any arable land, and, is, on that account, bad farming.

Farm-yard dung is also used in conjunction with other manures. Bones and guano are used along with it in the raising of turnips; and I am satisfied this is the best way of raising turnips, whether they are to be partly eaten off with sheep, or entirely carried away, and, at the same time, of maintaining the *stamina* of the soil, that is, its power of endurance under any system of cropping.

The durability of farm-yard dung is its great recommendation as a manure. Doubtless it is applied in large quantities, not less than from

* Johnston's Lectures on Agricultural Chemistry and Geology, p. 719.

10 to 20 tons per imperial acre, but a great proportion of this weight consists of water, even of well fermented dung; and were it practicable, or even proper to evaporate this, and thereby greatly reduce the weight, I am doubtful that the efficacy of the manure thereby would be impaired. I am persuaded that the first evaporation from a dunghill under fermentation consists entirely of water, and that not only a strong fermentation, but one conducted in an advanced part of the season, say not before April, is required before the constituents of a dunghill are begun to be dissipated. It is only after a *strong* smell is emitted, that a decomposition of parts is accomplished; for as to ammoniacal vapours flying off, ammonia has too strong affinity for water to leave the dunghill before it becomes dry enough.* For there is much virtue in the *sap* of dung, as the experience of every dry season confirms; and it is very difficult to evaporate the entire sap from a well-mixed dunghill, as the state of such dung shews even after fermentation has ceased in it.

Dung is applied at the commencement of every rotation of crops with the fallow green-crops, and with bare fallow; and when applied at any other time, it is near the termination of a long rotation. A rule for the quantity of farm-yard dung to be applied according to the length of the rotation, as given by Dr. Coventry is, that 5 tons per acre are required every year to sustain the fertility of soil; and therefore land which is dunged every 4 years in a rotation of 4-courses, should receive with the fallow-crop 20 tons per acre; in a 5-course shift, 25 tons; in a 6-course shift, 30 tons, and so on.† These quantities constitute, no doubt, a sufficient manuring to ordinary crops; but it appears to me to be reversing the order of propriety, to give land under the severest shift—a 4-course one—the smallest modicum of manure, when it should receive the largest; for there is surely truth in the observation, that land grazed with stock becomes ameliorated in condition—actually increased in fertility. A 6-course shift, therefore, having 3 years of grazing, should require less instead of more manure even at a time than a 4-course one on land of similar quality.

Human fæces.—The food of man being of the richest and most varied description, human fæces and urine should contain valuable and numerous ingredients as manure; and if the principle be sound, which Liebig maintains, that animals fed on a certain kind of food void excrements best suited as manures for raising that food, then the food of

* Professor Henslow's suggested experiments in Suffolk, may in time clear up this subject.

† Coventry's Notes on the Culture and Cropping of Arable Land, p. 4.

man should best be raised from his own excrements manuring the soil. The analysis of Berzelius of human urine and fæces gives the following constituents in 1000 parts:—

HUMAN URINE.	
Urea, ...	30.10
Free lactic acid, lactate of ammonia, and animal matters not separable from them, ...	17.14
Uric acid, ...	1.00
Mucus of the bladder, ...	0.32
Sulphate of potash, ...	3.71
——— soda, ...	3.16
Phosphate of soda, ...	2.94
——— ammonia, ...	1.65
Chloride of sodium, ...	4.45
Muriate of ammonia, ...	1.50
Phosphate of magnesia and lime,	1.00
Silica, ...	0.03
Water, ...	933.00
	1000.00

HUMAN FÆCES.	
Phosphate of lime, ... ——— magnesia, .. Traces of gypsum, ...	100
Sulphate of soda, ... ——— potash, ... Phosphate of soda, ...	8
Carbonate of soda, ...	8
Silica, ...	16
Carbonaceous residue and loss,..	16
	150

In regard to what man returns to the soil from which he extracts his own nourishment, it is thus represented by Liebig:—" The importation of urine or of solid excrements from a foreign land is quite equivalent to the importation of corn and cattle. All these matters, in a certain time, assume the form of corn, flesh, and bones; they pass into the bodies of men, and again assume the same form they originally possessed. The only true loss that we experience, and that we cannot prevent on account of the habit of our times, is the loss of the phosphates, which man carries in his bones to the grave. The enormous quantity of food which man consumes during the 60 years of his life, and every constituent of it that was derived from our fields, may again be obtained and restored to them. It is quite certain that it is only in the bodies of our youth, and in those of growing animals, that a certain quantity of phosphate of lime is retained in the bones, and of alkaline phosphates in the blood. With the exception of this extremely small proportion, in comparison with the actual quantity existing in the food, all the salts with alkaline bases, and all the phosphates of lime and magnesia which animals daily consume in their food—in fact, therefore, all the inorganic ingredients of the food—are again obtained in the solid and liquid excrements."*

* Liebig's Chemistry, in its application to Agriculture and Physiology, p. 178—18. Edition of 1843.

Human fæces constitutes a most efficient manure in the raising of turnips, but its tenacity renders it very difficult of application to the soil; and this is the case, whether it be commixed with a common dunghill, or with earth, chaff, or saw-dust, because none of these substances unite with it readily. It may be mixed with any of these ingredients, or applied alone, and if so, sparingly. As to the offensiveness of its odour, which many work-people stickle at, it may be overcome, by sprinkling occasionally over it, when being removed, a solution of the chloride of lime. This solution may be purchased in quart bottles at only 1*s*. each, and it should be diluted with 14 times its bulk of water when used. There is great waste of this valuable manure near dwelling-houses and farm-steadings; and though necessaries were erected, they would remain neglected.

Humen fæces is mixed with other ingredients, and sold under various denominations, such as poudrette, animalized carbon, desiccated compost, and the like. When such a composition is honestly formed, it cannot fail to make a powerful manure; but the farmer has no security against adulterations, and it is well known he is plundered at all hands by the imposition upon him of useless compounds. For my own part, I can say that when the animalized carbon first came to this country, about 20 years ago, it raised turnips as well and as cheaply as bone-dust; but it soon fell far short of its first exertions, though it rose in price as it fell in value. So with desiccated compost; I have tried it in comparison with farm-yard dung, pigeons' dung, and rich vegetable mould, and so far was it from being a manure at all, that even the black mould taken from the bottom of an old stone-dyke raised better turnips. Indeed, it scarcely afforded a better result than some drills which were not dunged at all, but were sown with turnips, by way of contrast and as a standard of comparison. I am sure many farmers have been grievously deceived in the purchase of manures, and this being the case, every *compound* he wishes to try, he should mix for himself at home with the genuine ingredients of which it should consist. Such a precaution is necessary, for to be deceived in the particular of manure, is, in effect, to incur the loss of a whole year's crop, and such a loss involves not merely individual, but national interests.

Bone-dust.—The composition of this substance, which is of so much worth to the farmer, I have already given (in 2529.), and, on account of its containing so great a variety of constituents, it is a true and valuable manure. It is now believed that the phosphate of lime, with which they most abound, is the most valuable ingredient in the manure of bones. Bone-dust exhibits, however, a peculiarity in its effects, as a manure, which seems inexplicable, namely, that a given quantity

produces a maximum effect. Thus, I have tried 12, 16, 20, and 24 bushels per acre with white globe turnips, and found the crop to improve with 12 to 16 bushels; but what is remarkable, neither the 20 nor the 24 bushels gave a greater crop than the 16. This, no doubt, may be explained from the probability of the turnip requiring only a certain quantity of nourishment, which the 16 bushels supplied, and this may account for the amount of the turnip crop received; but it cannot account for the insensible effects upon the succeeding crops, for neither the barley, the grass, nor the oats which followed the turnips in the rotation, were in the least more increased in bulk and quantity with the 20 and 24 bushels than with the 16, though the 16 yielded better than the 12. We cannot conceive that the soil received no greater benefit, as regards condition, from 24 than from 16 bushels, yet the crops indicated no difference whatever. It is true I did not measure and weigh every bushel and ton of the produce, but I had the same means of judging them all,—namely, by minute inspection. I knew that the respective quantities of manure and seed were applied during the entire rotation on every similar soil in quality and situation, in the same field, and on the same day. Nor were these comparative experiments conducted on a very small scale, such as $\frac{1}{8}$ of an acre; for each portion comprehended 4 long ridges of 15 feet in width, containing not less than 1½ acre. There were other results brought out by this experiment. The turnips were all carried off the ground, that is, none were eaten off with sheep, as the ½ should have been, and in so far the clearing of the field after bone-dust was an act of bad farming; but the robbery was committed from necessity, as there was a deficiency that season of dunged turnips for the cattle, whilst the turnips raised by bones were more extensive than the sheep I had could overtake. Though an act of bad farming, the experiment proved two important particulars; *first*, that bone-dust of itself benefits the whole crops of a rotation; the barley, grass, and oats, that followed the turnips, were all good; and, *second*, they were equally good, turnips, included, with similar crops raised in the same field, and on the same soil, with 16 tons of well-made farm-yard dung. Indeed the grass was in quality much finer. So we may conclude, that 1 bushel of good bone-dust is equal in effect upon crops, during a 5-course rotation, to 1 ton of farm-yard dung. It does not follow, however, from this result, that that small quantity of bone-dust will sustain the enduring fertility of soil for many years like dung.

Perhaps there is no way of applying bone-dust so efficaciously—and certainly there is none in my estimation—as upon farm-yard dung. Drill the land for turnips, say with 12 cart-loads of dung, and then sow

the seed with 8 or 10 bushels of bone-dust. The bone-dust secures the early progress of the plant, and the dung sustains it after the roots strike into it. Such turnips eaten off with sheep, should put and keep any land in good heart. With 8 bushels of bones, and finely riddled coal-ashes at pleasure, an excellent crop of turnips may be raised for sheep.*

Guano.—This is a foreign substance, which has only recently been introduced into the country as a manure. It is just the dung of birds, and is perhaps no better manure that that of our own sea-birds would be, could it be preserved; but no sooner is it voided, than the rain and snow, and waves of the ocean, wash it away; whereas, in the tropics, whether in America or Africa, the heat desiccates and preserves it immediately on being voided. It is a compound containing many ingredients, as may be seen from the following analyses:—

	By Bartels.	By Völckel.
Muriate of ammonia, ...	6.500	4.2
Oxalate of ammonia, ...	13.351	10.6
Urate of ammonia, ...	3.244	9.0
Phosphate of ammonia.	6.250	6.0
Waxy substance, ...	0.600	...
Sulphate of potash, ...	4.227	5.5
———— soda, ...	1.119	3.8
Phosphate of soda, ...	5.291	...
———— magnesia and ammonia,...	4.196	2.6
Chloride of sodium,......	0.100	...
Posphate of lime, ...	9.940	14.3
Oxalate of lime, ...	16.360	7.0
Alumina, ...	0.104	...
Residue insoluble in nitric acid, ...	5.800	4.7
Loss, consisting of water, ammonia, and organic matter, not estimated, ...	22.718	32.3

In the short time since the introduction of guano, it has proved itself a true and valuable manure. When tried on turnips against farm-yard dung, at the rate of only 3 cwt. per acre, it produced 20 cwt. 6 stones, on a similar piece of ground, that 18 cubic yards of dung per acre produced 19 cwt. 2 stones. Tested against bone-dust, at the rate of 16 bushels, and coal-ashes 8 bushels, together 24 bushels per acre which produced 19 cwt. 2 stones, guano, at the rate of 3 cwt. per acre, yielded

* Liebgig's Chemistry, in its application to Agriculture and Physiology, p. 181. Edition of 1843.

23 cwt. 2 stones. Against bone-dust alone, at the rate of 16 bushels per acre, which produced 24 cwt. 7 stones, guano, at the rate of 2 cwt. produced 31 cwt 4 stones.* Guano is very efficacious for turnips, along with a little farm-yard dung. Its fame as a manure is now established, though as a substance which would make a good manure, it was known and examined by Sir Humphry Davy more than 40 years ago. Such is the demand for it, that its price is about 10*l.* per ton, and it reached, in the summer of 1844, to 14*l.* The value of bone-dust, in consequence, has fallen to 1*s.* 9*d.* per bushel. In the use of guano precaution is requisite, as it is apt to effect the vitality of seeds sown in contact with it, so that a little earth between it and the seed is necessary.

Pigeons' dung.—This manure, I have no doubt, would be as valuable as guano, could it be obtained in sufficient quantity. I have tried to raise turnips with it, and succeeded to admiration; and one season, 1823, I raised Swedish turnips with 4 double cart-loads. The quantity was applied in the drill with a shovel by guess, but having the desire to make it go as far as possible, I suspected that I had stinted the land of manure. The seed was afterwards sown upon the drill, which buried the dung, and the crop throughout the season was very superior to that from farm-yard dung or bone-dust. The bulbs proved large, and a heavy crop; but I had not leisure at the time to attend to particulars. Next season the dove-cot only yielded 1 double load of dung, but so far as it went, I was equally successful in raising Swedish turnips. Tanners, I believe, will give a high price for pigeons' dung, as I have been offered 16*s.* per ton for it; but I would advise you rather to use it at home for Swedish turnips. I have seen it stated somewhere, that 50 bushels of pigeons' dung; or 40 bushels of pigeons' dung with 8 bushels of rape-dust; or from 12 to 15 bushels of pigeons' dung, with 12 to 15 bushels of bone-dust, are sufficient to raise turnips equal to a good dunging of farm-yard manure. My opinion is, that pigeons' dung is as efficacious as guano, or at least as bone-dust, and that, therefore, those quantities of pigeons' dung are much too great per acre imperial. When pigeons' dung is wetted with water, it ferments rapidly, and in a few days may be riddled and mixed with equal quantities of ashes, and sown for turnips, at 32 bushels per acre. When this mixture is spread in January or February, out of carts, as a top-dressing on new grass, it is said to make it fit for cutting 14 days earlier than the

* Transactions of the Highland and Agricultural Society, for October 1843. p. 70-2.

ordinary time. Whether these statements are strictly correct, I cannot say from my own experience, but they are worth testing by experiment.

Pigeons' dung has been chemically examined. "The excrements of pigeons," say Sprengel, "have been chemically examined by Sir Humphry Davy and myself. Davy found in 100 parts by weight 23 parts of substances soluble in water, consisting of urea, urate of ammonia, common salt, and some others. According to my own experiments, pigeons' dung half a year old, contained only 16 per cent. of bodies soluble in water, consisting of very little urea, but of a large proportion of carbonate, sulphate, and muriate of ammonia, common salt, and sulphate of potash. The other 84 parts insoluble in water consisted of coarse siliceous sand, silica, phosphates of lime and magnesia, traces of alumina, and oxides, of manganese and iron. The abundance of soluble substances explains the quick effect of pigeons dung, and also shews us once more the great value of mineral manure."* Hence the propriety of applying pigeons' dung fresh, or of strewing the floor of the dove-cot with soil abundant in humus, for the ammonia of the dung to combine with the humic acid of the earth.

Fish garbage.—In fishing villages, where fish are smoked or salted, a considerable quantity of fish refuse may be obtained, and it constitutes an efficient manure for every kind of crop. On the east coast of Scotland, 30 barrels of fish-heads and guts, half of cod and half of haddock, are enough of manure for 1 acre. The barrel contains 30 gallons, and 4 make a cart load. The refuse sells at 1*s.* 6*d.* per barrel, and so does liver and oil refuse. In preparing fish refuse for manure, it is emptied from the barrels on a head-ridge of the field to be manured, and mixed with a quantity of earth sufficient to cover the refuse completely. It is driven fresh to the field whenever a supply can be obtained from the fishers. In 2 or 3 months the compost is ready for use; and as a manure for turnips is superior to farm-yard dung, and equally beneficial on light and heavy soils. When used for turnips, the compost is spread with shovels out of the cart along the drills, at the rate mentioned; over which the drills are split, and the seed sown along the drills by the machine. Of course, it may be applied to bare fallow for wheat, as well as for green crops. It is sometimes laid on as a top-dressing in autumn upon lea, and ploughed in; and, as may be expected, the succeeding oats prove an excellent crop. Swedish turnips are afterwards taken with the ordinary manuring of farm-yard dung; and in

* Journal of the Royal Agricultural Society of England, vol. i. p. 493.

the circumstances, they never fail to yield abundantly, while the soil is put into the finest condition. From 400 to 600 barrels of this refuse are obtained by a farmer during the season; but those whose farms are nearest the villages have the best chance, unless a special agreement be made with the fishers. Fish refuse may, therefore, be regarded as a true manure (See 2401. 11.) In regard to sprats, as a manure, Mr. Cuthbert Johnson relates, that "the farmers of Essex and Suffolk purchase these fish by thousands of bushels at a time, and carry them in waggons 10 or 15 miles into the inland districts. The quantity applied per acre varies from 25 to 45 bushels, the poor gravelly soils requiring more than the loamy lands. They are spread by hand from seed-baskets, and on winter fallows intended for oats, on which, especially if the summer is not too dry, it produces most luxuriant crops, of a peculiar dark green colour, yielding 10 or 11 quarters per acre, and that on land of a very second-rate description. The effect of the application, however, remains only for 1 crop. They produce an equally good result, if mixed with earth, and suffered to remain and dissolve for some time in the heap, before they are carted on the land. In this way they answer exceedingly well for turnips. They are usually obtainable at the rate of 6*d.* or 8*d.* per bushel."* The refuse of pilchards and of herrings are, of course, of equal value to those mentioned, where they are obtainable.

Sea-ware.—To farmers situate on the sea-coast, this manure is a valuable acquisition, so much so, that, on the east coast of Fife, I have heard it stated that as much as 10*s*, per acre are offered for farms that command a large supply of sea-ware more than for others not so fortunately situate. On many of the farms in East Lothian, from 100 to 120 imperial acres are annually manured with sea-ware; and when I mention that 30 double-cart loads are spread on 1 acre, you may conceive the labour incurred in carting from 3000 to 3600 loads during a short season; for it is only in winter that the ware is cast ashore by storms, when the plants have arrived at maturity, and are more easily detached from the rock by a heavy sea. The collecting and driving are calculated in Fife to cost from 1*s.* to 1*s.* 2*d.* per cart-load. Sometimes when a bank of sea-ware has been driven on shore, and there is risk of its being washed away again by the waves, all hands are employed, men, women, and horses, to land as much as they can above high-water mark, as long as the danger of losing it exists. In Fife, 16 loads per acre of ware are supposed equal to 20 loads of farm-yard dung, but this seems

* Johnson on Fertilizers, p. 114.

an exaggeration. There is no doubt, however, that it makes an excellent top-dressing for the aftermath of a crop of hay. It is likewise spread on lea, and affords the means of yielding a fine crop of oats. It is also ploughed in with the oat-stubble, in preparation of the land for turnips. In all cases it is ploughed in as fresh a state as possible; and to assist the plough in burying the long leaves and tangles, a field-worker follows the plough, and rakes the ends of the ware into the furrow with a small dung-spreading graip. The composition of sea-ware, and a few remarks on its natural history, will be found in (2041-2-3,).

Cow's urine and dung are obtained by farmers from the cowfeeders in town, on payment of 5s. per cow for the year, and the expense of driving, when the cows are in the byre, and not in fields in summer; or, if paid for in kind, instead of money, ½ kemple of 16 stones, of 22lb. to the stone, per annum for each cow. Cow-dung is sold at 5s. per ton, or L 4 15s. per cow per annum. The market gardeners in the neighbourhood of Edinburgh manure their garden ground with cow-urine, to the extent of 40 tons per imperial acre. This quantity, though raising large crops of vegetables, is found to exhaust the soil so much as to become effete, and were it not stimulated with ordinary manure for some time, the vegetables would not arrive at perfection. On fields cow-urine may be applied with advantage in wet weather on clover aftermath that is intended to be taken up for oats, to the extent of 12 to 15 tons per imperial acre; but it has been found to injure oats after *rye-grass.*

The substances I have mentioned may all be regarded as true manures, that is, as possessing a composition, the particulars of which contain the substances requisite for the maintenance of all the plants cultivated on a farm; but there is a class of substances which, until very lately, were never regarded as essential to the well-being of plants, namely, their *specific* constituents, which are *inorganic* or *mineral.* The vegetable organic structure, which forms the body of the plant, is so obvious, that its maintenance has only hitherto attracted the attention of cultivators, and the nature of its minute constituents has been overlooked by men of science. True, hints have been thrown out, that, in consequence of the want of success in cultivating plants in particular circumstances, particular substances may be required to supply the peculiarities of their composition; and several years ago Mr. Grisenthwaite expressed his opinion, that it was by their special constituents that plants were alone contradistinguished from each other, the organic structure being alike in all; and therefore recommended a minute

analysis of all the cultivated plants to be undertaken, in order that the peculiar constituents of each might be ascertained. His reasoning on the subject was in these terms: "Elements, as the very term implies," he observes, "are now known to be incapable of being changed into each other. They admit, when considered *perse*, of no alteration but as regards magnitude and figure; and all the variety of matter discoverable in the world is produced by combination of these elements in different proportions. From this fact we are immediately led to deduce the following important conclusion? That when out of one substance another is to be formed, alcohol or acetic acid out of sugar, or, to confine our views to agriculture, grain out of manure, it is obvious that the elements of the first must be contained in the second; as if they be not, the conversion cannot take place. This is a truth which applies with peculiar force to the doctrine of manures, and renders it imperatively incumbent upon the agriculturist to investigate the constituents both of the crops he grows, and the manures he employs to make that growth successful. It is very reasonably to be feared, that many failures, quite inexplicable to the farmer, may be explained upon these principles. He has, very frequently perhaps, some grain upon land which has not contained the elements necessary to the production of the crop, and therefore the crop has failed; and he continues to suffer a recurrence of the same loss year after year, because he is unacquainted with the cause upon which it depends. If all crops were composed of the same elements, this reasoning, this discrimination, among manures, would not apply, nor be necessary to be regarded by the agriculturist; and it is upon such a supposition that the practices of husbandry have been uniformly conducted, and are at the present day conducted.

"To illustrate the preceding reasoning we may select the wheat crop as an example, which, while it is doubtless the most important to mankind, is also better known in its constituents than most other grain. If we examine the straw of wheat we shall find it to be composed of common vegetable matter; or of oxygen, hydrogen, and carbon. This I call *common vegetable matter*, because the elements are common to every known vegetable substance. If we examine the grain, we shall find its constituents to be starch and gluten; and if we carry our researches still farther, we shall find that the elements of starch are precisely the same with the element of common vegetable matter, viz., oxygen, hydrogen, and carbon; but the elements of the gluten, besides consisting of the three just named constituents, contain nitrogen also, an element not common to vegetable substance, but composing a large part of most animal matters. Now, from what has just been stated, it is clear that

the same manure which is employed in the production of the straw and the starch of the wheat crop, cannot possibly produce the gluten also. For this depends upon the presence of a distinct element, an element which cannot, as far as our present knowledge extends, be formed out of other elements, either by the operations of art, or by the process of nature, both of which are in reality the same. This is a fact which has never, I believe, been regarded by writers on the theory, or men engaged in the practice of agriculture; and yet upon it depends the successful cultivation of this most important crop."*

This extract really explains the entire motives by which the agriculturists at present desire to obtain the assistance of chemistry in raising larger crops and of better quality; and it contains the entire rationale of the doctrine of specific manures, the desire to apply which to field-culture has given the peculiar bias at present to the agriculturist's mind. It was reserved for Liebig to point out what those specific substances are which contra-distinguish the plants usually cultivated in the fields; and this knowledge he has acquired by the very means pointed out by Mr. Grisenthwaite, namely, by laborious analyses of the plants and of their products. His investigations in this difficult and interesting field of inquiry have enabled him to determine that ammonia is the most valuable food of plants: that supplies of it may be obtained for them by the decomposition of the various salts of ammonia; that other salts are required, if not directly, for yielding essential ingredients, at all events indirectly, for assisting in the decomposition of the ammoniacal salts; and that the ashes of plants indicate the peculiar mineral or minerals which each plant takes, in greater or smaller quantity, into its composition.

The employment of specific manures, recommended by theory in the first instance, and urged by the successful researches of chemical investigation, is now prescribed to the farmer as a practical operation; and it must be owned he has received the solicitation in a very confiding spirit, much more so than any subject I remember him to have received, which had not the previous sanction of his own experience. He has evinced a desire to try every suggestion offered, and has even gone the length of requesting a chemist of established reputation to examine the results of his experiments, and to suggest further experiments upon them, with a view to ultimately obtaining useful results. What those results may ultimately prove, time alone can determine; and as

* Grisenthwaite's New Theory of Agriculture, p. 161—4. Second edition, 1830.

every experiment in agriculture takes one year at least for its completion, that time must yet occupy several years. A great problem is evidently at work at present on this subject in the field of agriculture; and, as its object is decidedly good, I cannot but hope, for the sake of the country as well as the farmers, that it will be successfully solved. So long as it is under solution, however, I think the best plain for me is to decline entering into the subject of specific manures, because the mere enunciation, and much more the recommendation, of results, as yet untested is as likely to lead you into error, as to guide you towards truth; for repeated and extensive trials have yet to be made ere facts can be established; and without the establishment of indisputable facts no general conclusions for your guidance can be arrived at. The best service I can afford you at present is, therefore, to point out to you the best papers that have been written by the most extensive experimentalists; and as the subject admits of improvement by every new experiment, the accounts of the most recent experiments should possess the greatest interest. To open up the entire subject, would, besides occupy a much greater space than I have to spare; and if entered on at all in its present unfinished state, it could only consist of relating the particulars of what every experimenter had observed, and these you will appreciate far better in the experimenters own words.*

* See Transactions of the Highland and Agricultural Society for March 1844, pp. 161-204, by Mr. John Hannam, North Deighton, Wetherby, in Yorkshire. For patient investigation, accurate observation, clearness of detail, and intelligent deduction, this paper, in my opinion, is a perfect model of an account of agricultural experiments. In the Number for July 1844, pp. 227-49, the experiments of Mr. A. F. Gardiner, overseer to Mr. Fleming of Barrochan, in Renfrewshire, are very well related. In the same Number, from pp. 250-4, the conclusions by Mr. Lumsdaine of Lathallan, in Fifeshire, are correctly drawn from the experiments, and are in themselves important. In the Number for July 1843, pp. 28-36, the account of the experiments made by Mr. Maclean at Braidwood, near Penicuik, in Mid-Lothian, with 28 different substances, at a considerable elevation above the level of the sea, are worth perusal; as well as some experiments by Mr. Carstairs of Springfield, near Penicuik, on the effects of some special manures on moss-land, which are curious and encouraging to those who possess similar soil. In the Number for July 1844, pp. 277-9, Mr. Thomas Bishop, land-steward at Methven Castle, in Perthshire, gives an account of experiments made with a few uncommon substances, such as grass-weedings, cocoa-nut dust, carbonised saw-dust, exhausted cow-dung, wet wasted straw, compared with known fertilizers, in the Number for October 1843, pp. 64-7; and in the Number for October 1844, p. 304, and onwards, will be found one paper by Mr. John Finnie, Swanston, Mid-Lothian, and another by Mr. Charles Stevenson, Redside, East-Lothian. The Appendix to Professor Johnston's Lectures on Agricultural Chemistry and Geology is wholly occupied with accounts of experiments with special manures, made in different parts of the country, with such remarks upon, and suggestions from them, as the circumstances of each case called forth.

There are other substances employed as manure, very different from those just referred to, as well as from ordinary manures, and which can only be obtained in quantities in certain localities. For example, *soot* can only be obtained in large quantities from large towns, and it makes an excellent top-dressing for one season on grass. The quantity employed is about 40 bushels per acre, and the cost is from 1s. 3d. to 2s. 3d. per bushel. As this is a very disagreeable substance to sow with the hand, a machine has been in use for some years, for the purpose of distributing it equally over the surface of the grass-land, a description and figure of which, by Mr. Slight, will be found below. The effect of soot is to promote the growth of the leaves of plants, and particularly of grass, and to impart to them a dark green colour. I have heard it stated that cowfeeders object to graze cows on pasture that has been top-dressed with soot, in consequence of the taste which it imparts to milk; and they even object to purchase the hay for cows that has been saved from grass top-dressed with soot. The effects of soot are evanescent, not enduring beyond one season. It should be applied in spring when the grass is damp, and in calm weather. When applied in dry weather, it is apt to scorch the grass.

Woollen rags make an excellent manure for potatoes, when chopped small and strewed along the drills, at the rate of from 3 to 4 cwt. per acre on light, and 12 cwt. on strong soils. It is mostly used, however, for the manuring of hop-grounds. Trifling as this article may seem, 20,000 tons are annually used in England, as high as 5 guineas per ton.*

Green-weed of delicate variety, "found alone in protected situations in the estuaries of our rivers, is used in the upper parts of the Forth, and still more especially so in the Eden. Mr. Meldrum of Bloomhill, near St. Andrews, besides collecting the weed on his own shores, rents that of his neighbours. He frequently applies from 300 to 400 cart-loads in a single year, and reckons 10 cart-loads good, and 15 heavy, manuring. When laid on in winter, and ploughed into the furrow-ground, it produces a fine pulverising effect. With this alone a wheat crop of 6 quarters an acre has been produced, with a heavy crop of beans the year after without additional dung."†

Shell-fish and Shells.—I have known ground mussel and oyster shells used as manure for turnips; but double the quantity did not produce the same effect upon the crop as bone-dust; perhaps it would require 40 bushels to produce the same effect as 16 bushels of bone-dust. One use made of this shell-dust is to adulterate bone-dust therewith. It has

* Johnson on Fertilizers, p. 124.
† Quarterly Journal of Agriculture, vol. xi. p. 308.

been lately stated that common shell-fish, such as welks, cockles, and mussels, to the extent of 16 bushels per acre, have beeen employed with success to raise turnips, the bushel weighing 1 cwt. To those near the coast, with a rocky shore, such manure is obtainable.

Shell-marl.—In some parts of the country, such as Forfarshire, this substance is found in considerable quantities associated with peat. It occurs in beds in deep peat-bogs, lined above and below with a layer of very fine unctuous clay. It is taken out of the bogs by means of a boat mounted with a dredging apparatus. When of fine quality, and in a dry state, it is as white as lime, not crumbling down into powder like quicklime, but cutting something like cheese with the spade, and adhering in large lumps when spread. It is applied at the rate of from 40 to 50 bolls per imperial acre, the boll containing 8 cubic feet, and selling at 9d., making the cost of manuring from L.1 : 10s, to L.1 : 17 : 6 per acre, exclusive of the cost of carriage. When applied to land as a calcareous substance in moderation, it assists the action of ordinary manure; but it is too often applied solely as a manure, and in the above quantities, namely, from 35 to 45 cubic yards per acre, when it never fails to do mischief. It does not injure fresh land, it is true; on the contrary, it seems to stimulate it greatly, causing it to exert itself, and thereby soon becoming exhausted. When repeated frequently as a sole manuring, I have seen the land reduced to such a state of fermented dry pulverization, that with a stamp of the foot, the leg has been driven into the ground as high as the ankle, and a dust raised by the stroke. "Applied to lands followed by severe cropping," remarks Mr. Headrick, "it has reduced them almost to a state of utter sterility, which they have not recovered to this day."*

Besides those substances which attract the attention of most farmers, there are numerous others which may be used as manure, that are nearly overlooked by him, and these have been denominated *waste* manures. They comprehend all matters allowed to waste themselves on the farm; the sewerage of towns, which are allowed to run waste to an enormous extent; the waste of manufactures, such as shoddy, flax waste, sugar waste, tanners' waste, and the like; and local wastes, such as peat, weeds, ashes, &c. In regard to the importance of these substances as manures, trifling as they may seem, Mr. Hannam observes, in his preface, that, "while pointing out the waste of manure which too commonly

* Headrick's Agricultural Survey of Forfarshire, p. 406. In enumerating these substances, I have confined my observations to those which are within the reach of many farmers. For manures from more distant farms, I refer with pleasure to Mr. Hannam, of North Deighton's, Essay on Rape-Dust and Hand Tillages.

takes place throughout the country, and suggesting available means for its prevention, the author has endeavoured to call attention to the subject, as of an equal importance to the farmer individually, and the public generally; for though to make that which is useless to the farmer valuable to him, and to give him an efficacious and economical agent by which he may augment his produce, *is* one means by which he may *reduce his expenditure and increase his income*, at the same time it is one from which the public will reap an *increased supply* of food at *a decreased* cost.'*

Of the important part which every manure of the most trifling nature may play in the economy of husbandry, may be learned from these observations of Liebig: "It is certainly the case, that we could dispense with the excrements of man and animals, if we were able to obtain from other sources the ingredients on which depends all their value for agriculture. It is a matter of no consequence whether we obtain ammonia in the form of urine, or in that of a salt from the products of the distillation of coal, or whether we obtain phosphate of lime in the form of bones, or as the mineral apatite. The principal object of agriculture is to restore to our land the substance removed from it, and which the atmosphere cannot yield, in whatever way the restoration can be most conveniently effected. If the restoration be imperfect, the fertility of our fields, or of the whole country, will be impaired; but if, on the contrary, we add more than we take away, the fertility will be increased."† —*From Book of the Farm, August,* 1844.

Further Notices regarding Peruvian and Bolivian Guano.—Horticulture.—General Virtues of Guano.

The following extract from 'Hovey's Magazine,' forms a portion of an address delivered by J. E. Teschemacher, Esq., at a meeting of the Horticultural Society of Massachusetts, United States, relative to the value of guano as a manure:—"In the following experiments, I will first observe that all those plants which were treated with guano were potted in a mixture consisting of plain earth without any manure, sand, a little leaf-mould and peat, with which the guano was mixed; that those plants which are compared with them have been grown in the richest compost, and that both have had the same attention, and been grown otherwise under the same circumstances. Fuchsia fulgens, one year seedling, potted 17th June, when $2\frac{1}{2}$ inches high, with one tea-spoonful of guano; re-potted 9th August, then

* Hannam on the Economy of Waste Manures, p. vi., an excellent little treatise.

† Liebig's Chemistry in its application to Agriculture and Physiology, p. 177. Edition of 1843.

12 inches high, with another spoonful of guano, is now $1\frac{1}{2}$ foot high. The contrast between this and the two-year old plant is very striking, both as to luxuriance of growth and colour of the foliage, the plant with guano being vastly superior. I think also that the colour of the flowers is improved; it is well known among gardeners that it is rather difficult to grow this plant well. Pelargoniums—two seedlings grown with guano, and one of the same sowing without; on the 17th June the two former were potted with one tea-spoonful of guano, and re-potted on the 9th August with another tea-sponful; here also the difference in favour of guano is very great. China roses—two cuttings, potted 17th June, each with one tea-spoonful of gauno; one was then 7 inches high, the other $4\frac{1}{2}$; they are now 34 and 28 inches high respectively, with large healthy foliage and stems; these have not received a second application of guano. Celosia cristata, or cock's-comb—one seedling, with one tea-spoonful and one of the same sowing without; the size of the stem, foliage, and head of that with guano, is more than double that of the other, and the difference in the colour of the leaves is remarkable. Salvia patens, with one tea-spoonful of guano—the effect here has been to lengthen the joints, and the flower appears smaller than usual. Acacia Farnesiana—a seedling showing the size of the foliage and length of the joints previous to the application of a tea-spoonful of guano, and the remarkable growth of both afterwards. A camellia with two tea-spoonfuls—this specimen, which was quite small and unhealthy before the addition of guano, as may be seen by the lower leaves, exhibits in a most marked manner, by its beautiful large deep green leaves and healthy bud, the action of this manure. On a camellia grown with a large proportion of fine wood-charcoal, the foliage and buds are extremely fine and luxuriant, and of a healthy green colour, but not at all equal to that treated with guano. One balsam, two tea-spoonfuls, re-potted 9th August with two more, to which a little lime was added. This is an ugly specimen, which confirms an observation in the *Gardener's Chronicle,* that balsams manured with guano produced smaller flowers. I have watched it carefully, and found that not a single flower missed bearing its seed-vessel and that every seed-vessel I have opened contains from 14 to 20 perfect seeds. From what I have seen of guano it is clear that its action is rapid and powerful on the stem and foliage, increasing their size and deepening their green colour; of this fact there can be no doubt. I think it probable that it diminishes the size of the flowers in some cases, and that it improves the seed, both in quantity and quality; of this, however, more experiments are required to prove the certainty. When those plants were re-potted, which received a second application, the roots were very numerous, and appeared in the most vigorous health—thick, succulent, pure white, the tips with that hairy appearance so well known by cultivators as a sign of strong growth. In Peru it is customary, when using guano

to raise pepper, to manure three times : first on the appearance of roots, then on the appearance of the leaves, and lastly on the formation of the fruit. I think the experiment of its action on all fruits, particularly the larger fruit-trees, as apples, pears, peaches, &c., will be extremely interesting, as well as on the vine, which is well known to be excessively greedy for rich food, particularly for bone manure, the chief ingredient of which, phosphate of lime, guano contains in considerable quantity." Mr. Teschemacher then proceeded to show that guano contained, in large proportions, the ingredients necessary for the growth of plants in general, and for the maturation of seeds. "The nectariferous juices, or, as they are commonly called, the honey in flowers, are usually separated or secreted by glandular bodies called nectaries, and this honey has by many been supposed indispensable in the fecundation of the seed; but there are also glands on the leaves and leaf-stalks (petioles) of many plants, which perform the same office of secreting honey; here, of course, it cannot be of use for this purpose. Such glands exist on the petioles or leaf-stalks of most of the Acacia tribe; on the tips of three or four of the lower serratures on the leaves of Grewia, on various parts of the leaves or stems of the balsam, on passiflora, and many other plants. These glands only secrete honey during the youth and growth of the leaf; it is then only that their operation and beautiful structure can be properly observed. When the leaf has attained its full growth and perfection, the active part of these glands dries up, the time for observing their powers is past, and the leaf then proceeds in its owni mportant function of elaborating the sap. It has been lately surmised, and it appears to me with every probability of truth, that this honey is an excretion of the superabundant and useless part of the juices thrown off, after the leaf or flower has selected all that is necessary, precisely analogous to the excretions of the animal frame. I will attempt very briefly to show that this view, if correct, is of some importance, both to agriculture and horticulture. Mr. A. A. Hayes, of Roxbury, in a beautiful, simple, and, I believe, original experiment, before the Chemical Society of Boston, proved the existence of phosphoric acid (probably combined in several seeds), by immersing sections of them in weak solutions of sulphate or acetate of copper; in whatever part of the seed phosphoric acid existed, on that part was deposited a precipitate of phosphate of copper; this was particularly evident in the seeds of Indian corn. A certain quantity of phosphoric acid, or phosphates, is therefore necessary to the existence of these seeds; and that part of the plant (probably the flower) destined to perform the function of preparing the juices for these seeds, must go on exerting its utmost powers in selecting and rejecting until the requisite quantity of phosphates and other ingredients for the seed are obtained. Now the phosphates in most soils exist in extremely minute quantities; therefore, those plants and flowers whose seeds require them must extract large portions of

food from the soil before they can select the amount of phosphates necessary for the perfection of their seeds; and probably only as many seeds arrive at maturity as the plant can procure phosphates to complete; the remainder, embryos of which are always formed in abundance, are abortive—that is, never come to perfection. The same line of reasoning, of course, applies to the other necessary ingredients of seeds. If, therefore, we present to a plant food containing an abundant supply of these ingredients, it seems reasonable to suppose that we shall produce more seeds, or rather that more of the embryo seeds will be perfected. Now, the chemical analysis of guano shows that it contains, in abundance, most of the necessary ingredients of plants and seeds, the nitrogen of its ammonia being absolutely requisite for the cellular, vascular, and other parts of the stem and leaves, and its phosphoric acid, as well as its nitrogen, for the seeds; and if future experience should confirm what I have thus stated as an opinion, that the flowers of plants manured with gauno become smaller, it may be accounted for on the assumption that as there are presented to the plant these ingredients in abundance, particularly those necessary for the seed, the flower and its glands, whose office it is to prepare the latter, have less work to perform, less food to analyze, less to select, and less to reject; hence there is no necessity to have them of so large a size as where much exertion of these functions is required. The seed will also be larger and in greater quantity."

We shall forbear to enter on the chemical analysis of guano; it is more our province to show its effects, and to inform our readers how it may be most efficiently employed in horticulture. We have in progress various experiments to assist in proving its value; and, as far as these have gone, they have in general been most satisfactory. We have already proved that it may be used too freely, and that injury may be thereby produced. In a liquid state (four ounces to a gallon of water), applied twice a week for three weeks, to beds of strawberries, has occasioned an amazing growth of foliage and blossoms, but its influence on the crop of fruit remains to be seen. On the other hand, a bed of seedling Alpine strawberry plants, which had been up about a month, was thinly sprinkled with unmixed gauno in powder, and it destroyed every plant where it was applied. The half of a bed of onions, which were six inches high, were sprinkled over a month ago with pure guano, at the rate of two ounces to every square yard, being upwards of 5 cwt. to the acre; the season has been rainy, and the onions treated with guano are double the size of those not so treated. Potatoes, which were six inches high, had guano sprinkled along the rows, amongst their stems, at the rate of an ounce and a half to every yard: and these are now (five weeks subsequently) far superior to

those in parts of the rows purposely left without guano. Nine parts of light soil were mixed with one of guano, and half a spadeful of the compost was put into each of the holes regularly made to receive it, in a prepared bed of light soil; in the midst of the compost in each hole, a plant of Brussels Sprouts was put, and then well watered. This was done a month ago, and at the present time more than half the plants have dwindled and died. Geraniums were watered at intervals of a week, five times only in the whole, with guano water, four ounces to the gallon of water; their leaves began to curl, and, although the use of the liquid guano has been discontinued two months, it is unlikely that the plants will recover till they are potted in fresh soil. Plants of various sorts, in pots, watered only with guano water, half an ounce to a gallon, have flourished astonishingly—none have failed. These are lessons which cannot be mistaken.—*Hovey's Magazine of Horticulture.*

Experiments on Various Flowering Plants, with Guano and Nitrate of Soda. By J. E. Teschemacher.

Small parcels of the new manure guano having been very generally circulated in this vicinity, it is right to put those in possession of it on their guard against using it too freely; many plants in England, and some here having been killed for want of proper care in the application of it. Guano is an extremely powerful and warm manure, and, if applied in large quantities, or in lumps, destroys the roots. For pelargoniums, roses, and all hardy, strong-growing plants, one teaspoonful to a quart of earth, or about 1 part in 100, is sufficient; it should be pulverized and well mixed with the earth in which a plant is to be re-potted. When it is not convenient to re-pot, the earth may be gently stirred on the surface of the pot one or two inches deep, add guano pulverized, then mixed in; the plants should be kept well watered. Besides pelargoniums and roses, I have tried it on the Myrtaceous family, on ericas, fuchsias, and camellias; its effects on these are equally surprising. I have been also trying experiments on various plants with nitrate of soda; in every case I placed two plants, of the same species and of nearly the same size, close together; one of them was watered three times a week with a very weak solution of this salt, the other was under the usual management. The effect of the nitrate of soda has now become very evident, the plants watered with it are larger and earlier in bloom than the others; it appears, however, to me probable, that these effects will be rather evanescent, and the plants will always require this stimulant. I observe, in the English publications, that this constant necessity for the stimulant is urged against all these new manures, but surely there is no strength in this argument. All manures become exhausted, and the farmer has always to apply the stimulant of his manure-heap to make his land bear. From some experiments I have made, I think that guano will prove

a manure of much greater permanence than any that is now in use, particularly in soils deficient in phosphate of lime.—*Hovey's Magazine of Horticulture.*

The superintendent of the hardy department reported that he had tried several experiments with guano upon plants in pots. In loam, containing one-fiftieth part of this substance, verbenas and salvias became luxuriant in about the same degree as if potted in rotten dung. The same plants also flourished exceedingly in sand containing a similar proportion of guano. The same effect, or even a more beneficial action, was produced upon them when peat was substituted for sand. But when rich garden soil was employed with the same proportion of guano, the plants became languid and died. It was therefore inferred that the value of guano as a manure, will depend upon the soil with which it is employed, and that a quantity which would be highly beneficial in poor soil will become deleterious upon land previously rich and well manured.—*Proceedings of the Hort. Soc. No.* 17.

PEAS.

I have used guano on strong brick-earth at the rate of 30 cwt. per acre, with considerable advantage, as you will see by the accompanying pea, and they are all much of a size in the row; it was applied after they had grown about 12 inches. I mention this fact as there appears amongst your correspondents considerable doubts as to the maximum quantity of guano. Less than the above would kill grass, and no doubt would be dangerous on hot gravelly soils, or even on undrained clays that would cake near the surface. I have applied more than a ton and a half per acre on my flower-garden, in addition to considerable quantities of bone-dust, soot, salt, and nitrate of soda; and the extraordinary luxuriance of their growth, and the size of the flowers in a cold aspect, bear testimony to its utility. Care should be taken to apply it before or during rain, and not to allow it to touch the foliage. My potatoes and other vegetables appear to like the guano. On 8 acres of oats, on recently-drained strong land, I have used 4 cwt. of guano per acre on 3 acres; 4 cwt. of guano and 1 sack of common salt on 5 acres. In both cases the crops look well, although on poor exhausted soil after wheat; but where the salt is added there is a vast superiority, although that part of the field was sown at least a month later than the other; the difference is perceptible a quarter of a mile off. On another field of oats, 6 acres sown same time as the 5 acres, with one sack of salt and no guano, the corn looks healthy, but far inferior to that manured with guano. Two stetches on which were neither salt nor guano look yellow, miserable, and thin.—F. S. M. —*Gardeners' Chronicle, July* 1, 1843.

FIELD AND GARDEN PRODUCE.

Walton Nursery,
Near Liverpool, 15th February, 1844.

SIR,—I beg to acknowledge your letter of the 12th instant, and in answer to your question respecting the durability of guano as a manure, I have great pleasure in giving you my opinion, which is founded on experiments with the guano I have had from your house during the last three years. I am now thoroughly convinced that guano is not only a most valuable manure for the first crop, but for crops for years after, according to the quantity at first applied.

I have noticed minutely the effect of guano on the crops for three successive years, where it was first applied at the rate of 4 cwt. to the statute acre. The first crop was grass, the second turnips, the third oats, and every year each of those crops were excellent and decidedly better than when I applied 20 tons of farm-yard manure to the same quantity of land adjoining. There is, therefore, no longer any doubt in my mind about the lasting qualities of genuine guano as a manure, where it is properly applied for permanent purposes, nor can there be any doubt of its being the cheapest manure we know of; for in the experiments I allude to, the guano cost 2*l.* 8*s.*, the farm-yard manure 10*l.* 10*s.* per ton, being the common price for the best horse and cow dung here in the spring time.

In this neighbourhood a great deal of guano has been used for top-dressing grass land at the rate of 2 cwt. to the acre, and in all cases that I have heard of, it has given very great crops the first year; but some of the parties who have used it in this way, complain that they did not see much improvement in the crop the second year; I should have been very much surprised if they had, for I have many times seen 5*l.* worth of farm-yard dung applied as a top-dressing to an acre, and never could see any advantage of it after the first year. If people want manure to have a permanent effect, let them bury it in the land, and they will have the benefit for years, but if they take and scatter it to the sun and wind, without ploughing or digging it in, they will never see its effect after the first crop.

I continue to use guano to crops of all kinds on my farm or garden, and in my nursery grounds, and in a liquid state I have used it in my hothouses and greenhouses, to plants of every kind with great benefit to all.

In market gardens and kitchen gardens of any kind, I consider guano invaluable; for by proper application of the liquid in the spring months, you not only double the quantity of many crops, but with such as rhubarb, sea-kale, asparagus, &c. you get them much earlier, which is a double advantage. In short, in all the departments of my business, whether the farm or nursery, guano seems now indispensable. Whenever we see a crop not thriving, we apply guano the first *wet* day afterwards, and if the crop is not too far advanced, it generally has a very good effect.

manure cannot be valued at less than 12*l.* 19*s.* The barley following the turnips was a fair average crop, as was the hay; and on walking over the field at this season, I can distinguish the part manured with guano by its superior greenness and condition; it has a richer appearance than the remainder of the field. We find that by harrowing in with barley, at the time it is sown, 2 cwt. of guano per acre, we increase the yield of barley 3⅔ Carlisle bushels. The guano costs 25*s.*; the barley so obtained is worth 44*s.* I say nothing of the increase of straw and superior appearance of the sown grass, both of which are obvious.

From the meadow top-dressed with guano, at the rate of 3 cwt. per acre, in 1842 we had again a very good crop; in 1843, fully equal to that of 1842. The guano cost 1*l.* 17*s.* 6*d.* To have procured the same effect with manure, would have cost not less, certainly, than 7*l.* per acre.

The application of guano to oats has been as favourable as to barley, but I have not particulars at hand. I cannot speak to its effect on wheat, because the soil here is not suited to its growth. From the experience I have had of guano I am satisfied its introduction has raised the value of land situated at a distance from towns, but more especially of that where the soil is light.

It is admitted that the object of good farming is to produce the greatest quantity possible on a given quantity of land. To attain this object on soil such as I am accustomed to, I would use 2 cwt. of guano per acre on ploughing out of grass for oats, harrowing it in with the seeds. I would procure my turnips with the aid of 3 cwt. (4 cwt. causes them to be too gross, and on that account not to keep well) guano, to be eaten off by sheep or drawn; and I would, again, use 2 cwt. guano on sowing the barley, with which crop I would again lay the land to grass.

This system, I believe, from my experience, may be profitably followed, and the land be left in good condition; but it is evident from what I have detailed of the relative cost of guano and manure, that without the introduction of the former it would have been impracticable. It must not be forgotten that the use of guano, by increasing the produce to be consumed on the farm, increases the farm-yard manure. I repeat, the introduction of guano has added materially to the value of many estates.

I remain, dear Sirs,
Very truly yours,
THOMAS FISHER.

Messrs, Gibbs, Bright, & Co., Liverpool.

I consider the quantity of guano requisite

For Carrots,	4	cwt.	per acre,
Turnips,	3	,,	,,
Pasture, land	3	,,	,,
Hay ground,	3	,,	,,
Barley,	2	,,	,,
Oats,	2	,,	,,

New House, 24th Feb., 1844.

Dear Sir,—In reply to yours respecting the durability of guano as a manure, I only can give you the result of my experience from 1842 to the present time. On the 21st of June, 1842, I manured 3 acres for turnips with 2 cwt. of guano and 12 bushels bones per acre, mixed together 14 days before sowing; 1 acre with sulphate of ammonia, 4 cwt. to the acre; 1 acre with 4 cwt. of guano without any mixture; 1 acre with night-soil and ashes; and 1 acre with 15 loads of well-rotted farm-yard manure; the turnips were all sown on the 21st and 22nd of June, on drills of 26 inches asunder; in the month of November following, I had ¼ of an acre of each taken up, and topped and tailed, and the bulbs weighed as follows per acre.—

	T.	Cwt.	qr.	lb.
Guano alone, .. .	20	11	1	21
Bones and Guano, .	18	13	1	14
Ammonia, ...	17	0	3	0
Farm-yard manure, .	16	6	1	0

I sowed the field with oats and seeds in the spring of 1843; they were a very heavy crop all over the field, without any perceptible difference, and the seeds the same; upon a field of 5 acres, on another farm, in the same year, I manured 3½ acres with well-prepared farm-yard manure, and 1½ acre with 6 cwt. of guano, all upon the ridge of 26 inches; the turnips sown in June were all a good crop, but the 1½ acre manured with guano showed more superiority over that manured from the farm-yard than in the first field; this field was sown with barley in the spring of 1843, and at harvest the superiority of the barley-crop was even more conspicuous upon the 1½ acre than the turnip-crop, as I am convinced there were at least 6 bushels per acre more upon this than the other part of the field; and the seeds that were sown with the barley are at present far superior, so much so, that you may see to the inch where it is long before you reach the field; here is an evident superiority in the three first crops, viz. turnips, barley, and clover, and I have no doubt of the result of the wheat-crop, as a good clover-crop insures a good wheat crop. I have had many other proofs this last season of its superior fertilizing qualities over every other manure that has been put in competition with it, upon turf of different quality and texture, and as a manure for potatoes, but no doubt you have plenty of testimonials of its utility in these and other things.

To Mr. J. W. Myers. I am, Sir,

Yours truly,

Samuel Bell.

Mangel Wurzel.—In answer to the inquiries of "A Correspondent," at p. 216, respecting the application of genuine guano to the mangel wurzel crop, I beg leave to offer the following particulars of the method adopted by my gardeners last spring:—Drills were drawn 6

inches in depth and 2 feet apart, into which the guano was strewed at the rate of 1lb. to 15 yards, and covered over with an inch of mould; above this the mangel wurzel seed was afterwards sown. The produce of the seed thus treated was fully one-third more than of that which received a dressing of farm-yard manure, the average weight of the roots being from 8 lbs. to 9 lbs.— *E. S.—Gardeners' Chronicle, 27th May*, 1844.

WEST INDIES.

Sugar Cane.

Extract from one of eight Treatises on agricultural subjects, published in Jamaica, having been written for a Prize of One Hundred Guineas, offered by Lord Elgin, *the Governor of the Island, to be awarded to the author of the best Essay on these subjects.*

"On the 6th July, 1842, we applied 5 tons of guano to land turned up with the plough. The soil is light small-shot, or manganese, the poorest we have. The quantity given was one pint to four feet; and as there was more land opened than the guano would manure at this rate, we applied common compost from the cattle-pen to the remainder, in the usual way and quantity: I have thereby been enabled to contrast their comparative merits. The canes by both methods of manuring were planted at the same time. Those with the common compost will be fit to cut in the usual time for plants, say *fourteen or fifteen months old.* Those with guano must be cut in June, or at *eleven* months old. At this rate did their comparative growth commence, and so it has continued to maturity." To this is added the following additional report:—"The canes planted with guano in July, 1842, are now made into sugar (June, 1843). They have made excellent produce. In quantity they have exceeded the plants manured in the usual mode at the rate of one-eighth of a hhd. per acre. Had they been cut six weeks sooner, their produce would have been still greater.

The mixture recommended is one-sixth guano to five-sixths of a quart, consisting partly of ashes, marl, if at hand, and mould.* The quantity of this mixture to be applied is one quart to every four feet.

The author of this treatise, in a letter dated the 25th July, 1843, says—"The first ratoon sprouts from the roots of the plants lately cut, and which were originally manured with guano, are coming up with a rapidity which many would consider magical, without any further application of manure."

Barbadoes, 23rd August, 1843.

"Less than half a ton is not sufficient to manure an acre of canes in a proper manner; it is getting into high estimation as a manure,

* This quantity is probably sufficient, but it is only one-third of what was used in the experiment above detailed.

and the canes manured with it are greener than those which have been manured with animals." "WM. SHARP."

Jamaica, 22nd August.

"From what I have seen of the application of guano, I think great benefit will be received from it. The effect on a piece of ratoon canes to which it was applied, at the rate of ½ a ton to the acre, was remarkable. It caused the canes to take a rapid and luxuriant growth, so that they covered the ground in a very short time, which saved one clearing, if not more, and a great advantage, keeping the land cool. I have seen sugar made from land manured with guano: the colour was not quite equal to some on the estate, but the quantity more than doubled."

COFFEE.

Jamaica.

"At present, we may say, that guano having been found elsewhere a highly beneficial application to fruit-trees, there can be little doubt that where cultivation has declined from the age or heavy bearing of the trees, or from the exhaustion or washing away of the soil, benefit would be derived from the use of it or some of the other strongly stimulating manures now in general use. From the chemical analysis of guano, it appears particularly suited to the coffee-tree. This, however, is only to be tested by actual experiment. We will give all the information we possess as to the proportions used, and the mode of application to fruit-trees elsewhere, and the results as they become known; and we cannot doubt that practical men will be found to test its effects by experiment. We must, however, repeat the caution given in another column of our paper, and beg purchasers to be careful in obtaining what is genuine. The results of guano on grass-lands must be highly interesting to many whose pastures have suffered from various causes. Its application has produced effects scarcely to be credited if they were not well authenticated. One form of applying it, strongly recommended, is very simple and easily tried. On 1 lb. of good guano pour 8 gallons of water, let it stand 24 hours, then add 8 gallons more water, and let the whole stand 48 hours. This water may be applied to grass-land or vegetable gardens, it is stated, with the best results. A watering pot would help to distribute it equally; others recommend a stronger solution, 4 lbs. of guano to remain in 12 gallons of water 24 hours: the water to be then drawn off for use, 12 gallons of fresh water may be put on the same guano, and after lying 48 hours, be used as the first. A trial of both these proportions will test their comparative value."

Monthly Proceedings of the Society.

(*Wednesday, the 9th October,* 1844.)

The Hon'ble Sir J. P. Grant, *President,* in the chair.

The Minutes of the last general meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz. :—

Messrs. Macleod Wylie, F. Stainforth, John Jenkins, Richard Stuart Palmer, H. C. Metcalfe, Cecil Beadon, and Baboo Hurrynarain Day.

Candidates for Election.

The names of the following gentlemen were submitted as Candidates for election :—

R. Leishman, Esq. Calcutta.—Proposed by Mr. Wm. Storm, seconded by the Secretary.

Capt. A. Waugh, (Surveyor General of India).—Proposed by Dr. Huffnagle, seconded by Dr. Egerton.

G. G. Balfour, Esq. (Civil Service).—Proposed by Mr. W. St. Quintin, seconded by Mr. E. Jenkins.

Presentations to the Library.

1.—Madras Journal of Literature and Science, No. 30.—*Presented by the Madras Literary Society.*

2.—Journal of the Asiatic Society of Bengal, Nos. 62 and 63.—*Presented by the Society.*

3.—Five copies of Appendix A., Lists A. to L. of Dr. Griffith's Report on the H. C. Botanic Gardens, Calcutta.—*Presented by the Govt. of Bengal.*

4.—The India Review and Journal of Foreign Science and the Arts, No. 9 of vol. 1.—*Presented by the Proprietor.*

5.—The India Journal of Medical and Physical Science, Nos. 9 and 10 of vol. 2.—*Presented by the Proprietor.*

6.—Report of the Sudder Dewany Adawlut. N. W. P. on the administration of Civil Justice for 1842.—*Presented by the Govt. of the N. W. Provinces.*

Garden and Museum.

1.—A large cask of Peruvian Guano.—*Presented by W. P. Grant, Esq.*

2.—A small quantity of acclimated Cotton seed, the produce of the Lucknow Garden.—*Presented by Capt. G. E. Hollings.*

3.—One hundred specimens of the woods of Arracan.—*Presented by Lieut. Wm. F. Nuthall.*

Lieut. Nuthall mentions, that many of these woods are so very tough that they would answer admirably for Indigo presses, indeed superior to any wood procurable in Bengal. Should any information

be required in regard to any of these samples (all of which are numbered,) Lieut. Nuthall states, he will be glad to afford it, as also larger specimens of any that may be approved of.

The special thanks of the Society were voted to Lieut. Nuthall for this useful present, and for his kind offer of further assistance.

4.—Two musters (Pekoe and Souchoung) of Tea made in Assam. —*Presented by Wm. Storm, Esq., on behalf of the Directors of the Assam Tea Company.*

Mr. Storm states, that the average sale of this Tea in the London Market exceeds that of the China tea.

5.—A small model of a Wooden Chain-Pump from Chusan. —*Presented by Dr. Alexander Grant.*

6.—Two samples of *Sunn* grown at Bauglepore.—*Presented by Major Napleton on behalf of Baboo Gooroochurn Mitter.*

Mr. Law, in reporting on these samples states, that parcels as well cleaned as No. 1, generally bring about £22 per ton in the London market, but that No. 2 would not bring above £15 to £16 per ton.

The Patron of the Society.

The Secretary intimated to the meeting that, in consequence of the departure of Lord Ellenborough, a vacancy had occurred in the office of Patron of the Society; whereupon it was unanimously resolved, that the President be requested to wait on the Right Hon'ble the Governor-General, with the view of soliciting his Excellency's acceptance of the office.

Metcalfe Hall.

The Secretary laid on the table a statement which showed the receipts and disbursements on account of the above Building. The original estimate was Rs. 48,921-9-0; the final cost, in consequence of various additions to the original design, Rs. 67,566 : 6 : 3. The sums paid amount to Rs. 52,402-8-6, leaving a balance due of Rs. 15,163 :13 : 9 to the builders, besides 6,000 to the Union Bank, which had been borrowed to meet advances, making a total of Rs. 21,163 : 13 :9 due on account of the Building. The Secretary stated, that he had received a letter from the Hon'ble Sir Herbert Maddock, intimating that the Governor-General was desirous of putting his name down for Rs. 500 towards the fund that it had been proposed to raise by subscription, and that he, Sir Herbert, would give Rs. 250. Several other subscriptions were intimated. With regard to the Society's taking possession of its rooms, the Secretary read, at the request of the President, the substance of a letter which was to be addressed to the Builders, and which it was hoped would remove all difficulties.

Floricultural Exhibition.

A report from the Garden Committee submitting a list of prizes for flowers, and for a few vegetables and fruits, to be awarded from Sir Lawrence Peel's first quarterly donation of one hundred rupees, was read. The Committee suggest, that the show be held on Monday the

14th instant at 10 o'clock, being the day and hour fixed for the quarterly show of vegetables and fruits. The Report was confirmed.

Formation of an Oil Committee.

The Secretary intimated that, with reference to the resolution of the last meeting, requesting him to arrange for the formation of a permanent Committee, to be denominated the "Oil Committee," he had the pleasure to submit the names of the following members, who had consented to act on such Committee, viz :—

Dr. Mouat, Messrs. Wm. Haworth, James Cowell, H. Mornay, John Allan, H. C. Kemp, and Baboo Ramgopaul Ghose.

It was proposed by the President and resolved, that the above-named gentlemen do constitute the Oil Committee, and that it be incorporated in the list of the Society's Standing Committees.

East India Sugar Question.

The paper that was next read was a long and interesting communication from Mr. Sconce, at Chittagong, submitting whether some prominent steps should not be taken by the Society for the purpose of representing the interests of India in the question of Sugar, with reference to the approaching proposed change of customs' duty by the British Parliament.

At the close of the perusal of this letter, it was agreed, that the best thanks of the Society be given to Mr. Sconce, and that the subject-matter of his communication be referred for report to a Special Committee, consisting of the following gentlemen, viz :—

Messrs. John Allan, James Cowell, John Cowie, W. F. Fergusson, William Haworth, Charles Huffnagle, and Joseph Willis.

Chinese Agriculture.

The Secretary next drew the attention of the meeting to an highly interesting paper from the pen of Dr. Alexander Grant (H. C. S.) lately attached to H. M.'s 55th Regt. at Chusan, entitled "A Diary of Chinese Husbandry, from observations made at Chusan in 1843-44, illustrated by drawings of the implements of Agriculture, and of Rural Scenery,"—and read the following communication from that gentleman, presenting the above paper and drawings :—

To James Hume, *Esq., Honorary Secretary to the Agri-Horticultural Society of India.*

Dear Sir,—I have not been unmindful of the request conveyed to me in your letter of the 29th August 1843, acknowledging the receipt of my answers* to the queries respecting Chinese manures, circulated by the Agri-Horticultural Society of India. The paper which accompanies this note, contains the result of my observations, and I shall feel gratified if they tend to throw any new light on the useful subjects, which engage the attention of the Society. The kindly

* These answers are published in the second volume of the Society's Journal. —*Sec.*

disposition of the Natives, and the absence of every prejudice, have now afforded for the first time to Europeans, free opportunities of making an examination into their social condition, and I have in my almost daily walks availed myself of this new state of matters. The drawings of the implements of Agriculture were made at a single foons house—its owner a man of very moderate means. They are, I believe, the first complete set of the kind presented to the public.

Before the next meeting of the Society, I shall forward some drawings descriptive of lime, brick, and tile-making, as practised in the North of China. I was induced to notice these subjects by observing that the Royal Agricultural Society had, at their meeting in 1843, granted a silver medal for a patent machine for making tiles and bricks by severing the clay with wires; this method is in common use among the Chinese.

I beg to present the Society with a model of a Wooden Chain-pump from Chusan.

I am, &c.
(Signed.) ALEXANDER GRANT,
Asst. Surgeon.

Calcutta, 8th October, 1844.

On the motion of the Hon'ble the President, it was unanimously agreed, that the special thanks of the Society be given to Dr. Grant for his useful and interesting paper and drawings, and that they be referred to the Committee of Papers, with a view to their publication in the Journal.

The Assam Tea Plant, compared with that of China.

The Secretary mentioned that, since the last meeting, he had received, through Major Jenkins and Dr. Wallich, a paper which had been drawn up by Mr. J. W. Masters, regarding the identity of the Assam Tea plant with that of China; also a packet of dried specimens of the Tea plants therein alluded to; and that with the view of giving the communication (which came to hand just too late to be presented at the last meeting,) a place in the number of the Journal now in the press, he had, in anticipation of the Society's sanction, transferred it with the specimens to the Committee of Papers. The best thanks of the Society were given to Mr. Masters for this interesting paper.

Carey Testimonial.

A communication was read from Dr. Royle, intimating that he had given the Society's commission for a bust of Dr. Carey to Mr. Lough. The following is an extract of Dr. Royle's letter on the subject :—

"I do not know whether I mentioned in my former letter that I had given your commission for a Bust of Dr. Carey to Mr. Lough; I was myself so much struck with a work of his which I saw at Sion House, the Battle of the Standard, that I procured an introduction to see his studio. His works in last year's exhibition, raised his name so

high, that I had no difficulty in determining upon the sculptor. Since then he has exhibited his two great works— a king making a knight-banneret, and a wife finding the dead body of her husband on the field of battle, by his charger remaining by the body. The Queen has also given him the commission for her statue for the Royal Exchange, and he is executing the monument with a reclining figure of Mr. Southey. So that your Bust will be executed by one of the leading sculptors of the day, if not the leading sculptor."

Communications on various subjects.

1.—From Dr. Royle, forwarding copy of a letter from Mr. Groom, respecting the assortment of bulbs transmitted by him to the Society in 1843-44, the bill for which, amounting to £54, was submitted at a former meeting in April last.

Resolved. With reference to the difference of opinion in regard to the quality of these bulbs, that Dr. Griffith be requested to address those parties in the Upper Provinces to whom portions of the supply had been sent by him, and that, on receipt of their replies, he be further requested to favor the Society with a report on Mr. Groom's letter. Dr. Griffith, who was present, consented to carry out the wishes of the Society.

2.—From Capt. W. W. Dunlop, Secretary of the Branch Society at Cuttack, reporting on the various seeds received from the Parent Society, sown in their Garden.

3.—From James Cowell, Esq., intimating that it would be advisable, before incurring the expense for a large supply of madder seed, as suggested at the last meeting, to indent for a *small* consignment, in order to test its applicability to the country, and that with this object in view, he had taken steps to procure for the Society about one cwt. of the seed from Belgium or the South of France.

The best thanks of the Society were given to Mr. Cowell for the consideration and trouble he had taken.

4.—From G. C. Cheap, Esq., dated Bauleah, Sept. 10th, giving the result of trials with the Affghanistan seeds presented to the Society by Major Wm. Anderson.

5.—From Col. J. R. Ouseley, promising to obtain the required information regarding the white linseed of Hoosungabad.

6.—From L. Wray, Esq., offering his assistance to procure from his friends at Manilla, such rare plants or seeds as the Society may require.

Mr. Wray's offer was accepted, and the Secretary was requested to tender the thanks of the Society for the same.

7.—From Cecil Beadon, Esq., Under-Secretary Govt. of Bengal, offering the best thanks of the Right Hon'ble the Governor, for the gratuitous supply of cotton seed for the experimental farm at Dacca.

8.—From A. Rogers, Esq., Honorary Secretary Assam Company, offering the best thanks of the Company, for three copies of the Journal of the Society, Part 1 of Vol. 3.

9.—From Captain G. E. Hollings, entering into some interesting particulars regarding various cultures in the Lucknow Public Garden.

For all the above communications and presentations, the best thanks of the Society were accorded.

(*Wednesday, the* 13*th November*, 1844.)

W. Storm, Esq. in the chair.

The Minutes of the last general meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting, were duly elected members of the Society, viz :—

Capt. A. Waugh, Messrs. R. Leishman and G. G. Balfour.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Mr. J. G. Llewelyn, Calcutta.—Proposed by Mr. G. F. Remfry, seconded by the Secretary.

E. V. Irwin, Esq., Civil Service, Tirhoot.—Proposed by Major T. E. A. Napleton, seconded by the Secretary.

Charles Macleod, Esq.—Proposed by Mr. W. G. Rose, seconded by Mr. W. Storm.

Presentations to the Library.

1.—Reports of the Bombay Chamber of Commerce for the 3d and 4th quarters of 1843-44.—*Presented by the Chamber.*

2.—Calcutta Journal of Natural History, No. 19.—*Presented by Dr. M'Clelland.*

3.—The Indian Journal of Medical and Physical Science, No. 10 of Vol. 2.—*Presented by Dr. Eveleigh.*

Garden and Museum.

1.—A few roots of the *white* sweet potatoe from the Sumbulpore District.—*Presented by Col. J. R. Ouseley.*

Colonel Ouseley observes that this variety is unknown in Upper India and Behar, and is said to be also unknown in Calcutta; in that case he offers to send a large supply, as they are much better than the *red* kind.

The Secretary mentioned he had requested Col. Ouseley to favor the Society with a large supply, for culture at the Nursery Garden, with a view to future distribution.

2.—Sample of coffee, the produce of Captain Brodie's Garden at Seebsagur, Assam.—*Presented by John Owen, Esq.*

3.—Sample of cotton grown at Rungpore from New Orleans seed, acclimated at the Coimbatore Government farms.—*Presented by H. Rehling, Esq.*

4.—A piece of teak timber and samples of tobacco and cotton from Arracan.—*Presented by Major Bogle.*

"The American maize has succeeded well. I have obtained a large quantity of the corn from what you sent me, and next year will be able to cultivate a few fields, and to supply the people in this part of the country with seed. I have had many applications for it, but could only satisfy a few."

5. From Dr. Wm. Jameson, Supdt. of the Botanic Gardens, N. W. P., intimating his intention of complying with the request of the Society for specimens of the tea manufactured in Kemaon, so soon as a supply reaches Saharunpore.

6. From Messrs Villet and Son, of Cape Town, forwarding the Society's annual consignment of vegetable seeds per *Gloriana*, amounting to 1,430 rupees, and giving the following account of the delay in its transmission :—

"We exceedingly regret that the shipment will come to hand rather late in the season, but it is not owing to any neglect of ours, but want of opportunity direct for your port previous to the present one. The seeds were ready for shipment two months ago, intended for the *John Woodall*, but you are aware of what occurred to that vessel. In other respects, we have every reason to hope, that the present shipment will give satisfaction, the seeds being fresh and good."

For all the above communications and presentations, the thanks of the Society were accorded.

LIST OF MEMBERS

OF THE

Agricultural & Horticultural Society

OF

INDIA.

DECEMBER 31*st*, 1844.

Patron:

THE RIGHT HONORABLE SIR HENRY HARDINGE, G. C. B.,
GOVERNOR GENERAL OF INDIA, ETC. ETC. ETC.

OFFICE BEARERS.

President:

SIR JOHN PETER GRANT.

Vice-Presidents:

SIR LAWRENCE PEEL.
C. K. ROBISON, ESQ.
RAJAH RADHAKAUNT DEB, BAHADOOR.
BABOO RAMGOPAUL GHOSE.

Honorary Secretary:

JAMES HUME, ESQ.

Deputy Secretary & Collector:

A. H. BLECHYNDEN, ESQ.

List of Members.

* This mark denotes Members, who have compounded for their Annual Subscriptions.
† This mark denotes Members, who are absent from India, and therefore Non-contributors.

HONORARY MEMBERS.

The Right Honorable Sir Edward Ryan, A.M., F.A.S., *London.*
Baron Von Ludwig, *Cape of Good Hope.*
Charles Huffnagle, Esq. M.D., *Calcutta.*
John Forbes Royle, Esq. M.D.,F.R.S.,F.L.S.,F.G.S., *Professor of Materia Medica, King's College, London.*
Colonel John Colvin, C.B., *Bengal Engineers, London.*
Thomas Waghorn, Esq. *Egypt.*
J. Mackay, Esq.
Don Ramas de la Sagra, *Island of Cuba.*
Dr. Justus Liebig, *Professor of Chemistry in the University of Giessen, Germany.*

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Abercrombie, Lieutenant William, *Bengal Engineers, Agra.*
Adam,† George Ure, Esq. *Merchant.*
Agabeg, Joseph, Esq. *Merchant, Calcutta.*
Ainslie,† William, Esq. *Merchant.*
Ainslie, Daniel, Esq. *Merchant, Calcutta.*
Alexander,† Nathaniel, Esq. *Merchant.*
Alexander,† J. W. Esq. *Assignee of Insolvent Estates, &c.*
Alexander, William Stewart, Esq. *Civil service, (Cape of Good Hope.)*
Allan, John, Esq. *Merchant, Calcutta.*
Allan, Robert Townsend, Esq. *Attorney, Supreme Court, Calcutta.*
Allen, C., Esq. *Civil service, Cawnpore.*
Alves,† Colonel N.
Amman, Ernest M., Esq. *Indigo Planter.*
Andrew, John, Esq. *Merchant, Calcutta.*

Annand, Adam Smith, Esq. *Civil service, Sylhet.*
Anstruther, The Honorable P., Esq. *Colonial Secretary, Ceylon.*
Ashootos, Dey, Baboo, *Merchant, Calcutta.*
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Aylwin, D. C., Esq. *Merchant, Calcutta.*

Baillie,† Neil Benjamin Edmonstone, Esq. *Attorney.*
Balfour, G. G., Esq. *Civil service, (Cape of Good Hope.)*
Balfour, Lewis, Esq. *Merchant, Calcutta.*
Barlow, Robert, Esq. *Civil service, Calcutta.*
Baron,* P., Esq. *Indigo planter, Shajehanpore.*
Barton, George, Esq. *Merchant, Calcutta.*
Beadon, Cecil, Esq. *Civil service, Calcutta.*
Beaufort, Francis L., Esq. *Civil service, East Burdwan.*
Becher, John Edward, Esq. *Indigo planter, Tirhoot.*
Bell, R. C., Esq. *Indigo planter, Boroy Factory viâ Mahomedpore.*
Bell, H. Hamilton, Esq. *Landholder, Agra.*
Bennett, William, Esq. *Soubutpore Factory, Commercolly.*
Bentall,* Edward, Esq. *Civil service, Jessore.*
Bidwell,† Alfred Clarke, Esq. *Civil service.*
Birch,* Captain Frederick William, (41st Regiment N. I.,) *Superintendent of Police, Calcutta.*
Birch, Lieutenant Colonel R. J. H. *Judge Advocate General, Calcutta.*
Birjonauth Dhur, Baboo, *Merchant, Calcutta.*
Biscoe,† Thomas Porter, Esq. *Civil service.*
Bishop. Captain G. W., *Commanding Sappers and Miners at Darjeeling.*
Blake,† C. H. Esq.
Blaney, R. E , Esq. *Assistant to the Superintendent of Salt Works, Howrah.*
Bluntish, Robert, Esq. *Paymaster H. M. 9th Regiment, Subathoo.*
Bogle, Major Archibald, (2nd Regiment N. I.,) *Commissioner of Arracan, Akyab.*
Boldero, John Stephen, Esq. *Civil service, Agra.*
Bowring, Samuel, Esq. *Civil service, Calcutta.*
Boyd, W. S., Esq. *Merchant, Calcutta.*
Boyle,† E., Esq. *Merchant.*
Bracken, William, Esq. *Civil service, Calcutta.*
Bracken, Thomas, Esq. *Secretary, Bank of Bengal, Calcutta.*
Braddon, William Clode, Esq. *Merchant, Calcutta.*
Brae, Thomas, Esq. *Indigo planter, Calcutta.*
Broadfoot, Major George, C. B., A. G. G. North West Frontier, *Ferozepore.*

Brodie,* Lieutenant T. (10th Regiment N. I.,) *Principal Assistant to the Commissioner of Assam.*

Brooke, Lieutenant John C., (63rd Regiment N. I.,) *Adjutant, Meywar Bheel Corps.*

Brown, Forbes Scott, Esq. *Merchant, Penang.*

Brown, W. D., Esq. *Merchant, Akyab.*

Brown, J. C., Esq. *Civil service, Kishnaghur.*

Brownlow, Henry, Esq. *Civil service, (Cape of Good Hope.)*

Buckle, Captain E., *Assistant Adjutant General,* Artillery, *Dum-Dum.*

Buckland, R. H., Esq. *Merchant, Calcutta.*

Buller,* Frederick Pole, Esq. *Civil service, Shajehanpore.*

Brunet, P., Esq. *Indigo planter, Nohutta Factory, Jessore.*

Burnett, Lieutenant F. C., Artillery, *Dum-Dum.*

Burt,† Benjamin, Esq. M.D., *Bengal Medical service.*

Bushby, George Alexander, Esq. *Civil service, Calcutta.*

Butcher, Charles, Esq. *Indigo planter, Dacca.*

Byrne, Wale, Esq. *Head Assistant, Judicial and Revenue Department of Government, Calcutta.*

Calcutta, the Right Reverend the Lord Bishop of.

Calleychunder Lahoree, Baboo, *Dewan to the Rajah of Cooch-Behar.*

Cameron, The Honorable C. H., Esq. *Member of the Supreme Council, Calcutta.*

Campbell, W. F., Esq. *Merchant, Calcutta.*

Campbell,† Donald, Esq. *Merchant.*

Campbell, Colin, Esq. *Merchant, Calcutta.*

Campbell,* Archibald, Esq. M.D., *Medical service, Superintendent of Darjeeling.*

Campbell, Robert, Esq. *Merchant, Calcutta.*

Campbell, John, Esq. *Cawnpore.*

Campbell, Lieut. Robert, (47th Regiment N. I.) *Gowhatty, Assam.*

Cardew, Cornelius, Esq. *Civil service, Cuttack.*

Carmichael, Lieutenant Colonel C., *Military service.*

Carpenter, Major T. D., *Governor General's Agent, &c. Benares.*

Carter, J. W., Esq. *Merchant, Calcutta.*

Carter, P. P., Esq. *Indigo planter, Bhojepore Factory, near Buxar.*

Cartwright, Major General E., *Commanding the Presidency Division.*

Cathcart, John Fergusson, Esq. *Civil service, Tirhoot.*

Caulfield,† Major General James, C. B.

Cautley, Captain P. T., Bengal Artillery, *Superintendent of the Doab Canal, Delhi.*

Cazenueve, J. P., Esq., *Indigo planter, Tirhoot.*
Chapman, Charles, Esq. *Civil service, Chuppra.*
Chapman,† Henry, Esq. *Merchant.*
Charles, Rev. James, D.D., *Senior Minister, St. Andrew's Church, Calcutta.*
Cheap, George Charles, Esq. *Civil service, Baulealt.*
Cheape, Colonel John, C. B., *Chief Engineer, Fort William.*
Cheek, George Nicholas, Esq. *Medical service, Bancoorah.*
Cheek, A. H., Esq. *Medical service, Sullutpore, via Jansy.*
Clapperton, Captain A. B., *Assistant Master Attendant, Calcutta.*
Clarke,† Longueville, Esq. F.R.S., *Barrister, Supreme Court.*
Close, Lieutenant Edward, (32d Regiment N. I.,) *Jubbulpore.*
Clunes, A. G., Esq. *Indigo planter, Jessore.*
Colnett, Major James Richard, (17th Regiment N. I.,) *Calcutta.*
Colvin,† Colonel John, C.B., *Bengal Engineers, (Honorary Member.)*
Colvin, B. J., Esq. *Civil service, Calcutta.*
Colvin,† Alexander, Esq. *Merchant.*
Colvin,† John Russell, Esq. *Civil service.*
Connyeloll Tagore, Baboo, *Merchant, Calcutta.*
Cooper, Captain G. L., (Artillery,) *Ajmere.*
Cooper, J. H., Esq. *Tutor to the Nawaub of Moorshedabad, Berhampore.*
Corbett, Major Stuart, (25th Regiment N. I.,) *Dinapore.*
Corbyn, Frederick, Esq. *Medical service, Simla.*
Cossinauth Dutt, Baboo, *Merchant, Calcutta.*
Cotton, Captain Henry, (67th N. I.,) *Deputy Judge Advocate General, Saugor Division.*
Coull,† Archibald D., Esq. *Indigo planter.*
Courjon, F., Esq. *Indigo planter, Chandernaghur.*
Cowell, James, Esq. *Merchant, Calcutta.*
Cowie,* Henry, Esq. *Merchant, Calcutta.*
Cowie, David, Esq. *Merchant, Calcutta.*
Cowie, John, Esq. *Merchant, Calcutta.*
Cox, Lieutenant Colonel Henry, C.M., (58th Regiment N. I.,) *Jubbulpore.*
Cracroft,† William, Esq. *Civil service.*
Crawford,† Stephen Rowan, Esq. *Merchant.*
Crooke,† James, Esq. *Merchant.*
Crooke, Arthur, Esq. *Indigo planter, Tirhoot.*
Currie, Edward, Esq. *Civil service, (Cape of Good Hope.)*
Currie, J. A., Esq. *Merchant, Calcutta.*
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Sturgis,† Henry P., Esq. *American Consul, Manilla.*
Sturt, R. R. Esq. *Civil service, Backergunge.*
Sutherland,† Colonel J.
Sutherland, Patrick, Esq. *Assistant Military Board Office, Calcutta.*
Suttoo Churn Ghosaul, Rajah, *Calcutta.*
Syme,† Andrew, Esq. *Merchant.*
Swinhoe, T. B., Esq. *Attorney, Calcutta.*

Talib Ally Khan, *Zemindar, Gyah.*
Taylor, C. B., Esq. *Palamow.*
Thomason, The Honorable James, *Lieutenant Governor of the N. W. Provinces, Agra.*
Thompson, R. Scott, Esq. *Chemist, Calcutta.*
Thompson, J. V., Esq. M.D., F.L.S., *Deputy Inspector General of Hospitals, Sydney.*
Thomson, R. M. M., Esq. M.D., *Medical service, Calcutta.*
Thornton, John, Esq. *Civil service, Agra.*
Thurburn, R. V., Esq. *Indigo planter, Kishnaghur.*
Tiemroth,† C., Esq.
Tiery, L., Esq. *Indigo planter, Berhampore.*
Todd, Major E. D'Arcy, *Artillery, Delhi.*
Todd,† James, Esq.
Tonnochy, Thomas, Esq. *Deputy Collector, Bolundshohur.*
Torrens, Robert, Esq. *Civil service, Calcutta.*
Tremblehansen, W. C., Esq. *Indigo planter, Shahabad.*
Trevor, Edward Tayler, Esq. *Civil service, Cuttack.*
Trotter,† John, Esq. *Civil service.*
Trotter, T. C., Esq. *Civil service, Patna.*
Tucker, Charles, Esq. *Civil service, Calcutta.*
Tucker, Henry Carre, Esq. *Civil service, Goruckpore.*
Tulloh, C. R., Esq. *Civil service, Futtehpore.*

Turner,* Thomas Jacob, Esq. *Civil service, Allahabad.*
Turner, George, Esq. *Medical service, Mirzapore.*
Turton,† Sir Thomas E. M., Bart. *Barrister, Supreme Court.*
Tweedie,† John, Esq. *Indigo planter.*
Twemlow, Major George, *Nizam's Army, Ellichpore.*

Vetch, Captain Hamilton, *Political Assistant, Debroghur, Upper Assam.*

Waghorn, Thomas, Esq. *Egypt, (Honorary Member.)*
Walker, Richard, Esq. *Civil service, Calcutta.*
Wallace, A., Esq. *Merchant, Calcutta.*
Wallich, N., Esq. M.D., F.R.S., F.L.S., F.G.S., *Superintendent of the H. C. Botanic Garden, Calcutta.*
Walters,*† Henry, Esq. *Civil service.*
Warner,† Edward Lee, Esq. *Civil service.*
Watson,† Major General Sir James, K.C.B.
Watson,† John, Esq. *Indigo planter.*
Watson,* Robert, Esq. *Indigo planter, Calcutta.*
Watt, Robert, Esq. *Indigo planter, Tipperah.*
Watts, H. C., Esq. *Collector of Assessment, Calcutta.*
Waugh, Captain A. S., *Surveyor General of India, Allahabad.*
Wemyss, Captain James, (44th Regiment N. I.) *Lucknow.*
Wight,* Robert, Esq. M.D., *Madras Medical service, Superintendent Government Cotton plantations, Coimbatore.*
Williams, Fleetwood, Esq. *Civil service, Budaon.*
Williams, Lieutenant W. H. (67th N. I.) *Sylhet.*
Willis, Joseph, Esq. *Merchant, Calcutta.*
Wise, J. P. Esq. *Indigo planter, Dacca.*
Wise, Thomas, Esq. *Medical service, Calcutta.*
Woodcock, T. Parry, Esq. *Civil service, Allahabad.*
Woodcock,† E. E. Esq. *Civil service.*
Wood, George, Esq. *Calcutta.*
Wollaston,† Henry A., Esq. *Merchant.*
Woomeschunder Roy, Baboo, *Landholder, Santipore.*
Wray, L., Esq. *Calcutta.*
Wyatt, Thomas, Esq. *Civil service, Rungpore.*
Wylie, Macleod, Esq. *Barrister, Supreme Court, Calcutta.*

Young,* Thomas, Esq. *Civil service, Backergunge.*
Yule, J. W., Esq. *Indigo planter, Tirhoot.*

Meteorological Register kept at the Surveyor General's Office Calcutta, for the Month of October 1844.

Observed at 9 H. 50 M.					Observations Made at Apparent Noon.					Observed at 4 P. M.					Observations Made at Sun set.					Rain Gauges.	
	Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.		
Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Upper.	Lower.
Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
30,025	82,0	84,0	82,0	N. W.....	30,000	82,7	84,5	82,8	W. S. W.	29,929	85,7	84,0	83,0	N.	29,937	85,4	84,8	84,0	W.		
,041	83,4	86,0	85,0	N. E.	,014	86,0	88,8	86,0	N. W.....	,950	85,7	89,7	86,5	N. W.....	....	..	..	..	....		
,033	85,4	87,0	85,0	W.	,017	87,0	88,4	86,0	N. W.....	,954	89,0	91,0	86,0	N. W.....	,957	87,5	88,0	85,0	Calm, ...		
,065	85,8	89,0	86,0	E.	,026	87,5	90,6	86,7	E.	,954	90,0	92,0	86,4	N.	,954	88,0	88,0	85,7	N.		
,065	86,0	89,0	85,4	N. E.	,029	88,5	92,5	88,0	N. E.	,929	89,6	92,0	87,6	N. W.....	,937	88,9	88,4	86,0	N.		
,033	85,4	85,0	84,0	W.	29,974	85,7	85,4	84,2	S. W.	,917	83,0	79,9	79,7	E.	,914	81,0	78,0	78,2	S.........	0,20	0,25
29,990	82,0	82,8	82,0	E.	,941	83,8	84,0	83,8	N. E.	,865	85,0	86,4	84,5	N. E.	,893	85,0	84,0	82,4	E.	0,18	0,24
30,010	82,5	84,0	83,0	N. E.....	,970	84,5	89,0	86,0	E.	,905	86,0	87,0	86,0	E.	,905	82,0	81,0	81,3	N. E.		
,028	83,0	84,0	83,0	N. E.....	,970	84,9	87,8	84,8	E.	,954	83,0	78,0	79,0	S. E.	,933	80,4	77,0	77,9	E.	1,59	1,66
,038	79,0	75,0	76,4	E.	30,000	78,8	76,0	76,7	E.	,937	77,0	74,7	75,8	E.	,929	77,7	75,0	76,0	E.	0,76	0,86
29,950	77,5	77,4	78,0	S. E.	29,906	78,5	79,0	79,1	S. E.	,815	79,7	79,9	79,9	S. E.	,838	79,5	78,0	79,0	S. E.	0,05	0,07
,842	80,8	82,0	80,8	S. W.....	,800	82,0	84,2	82,9	S. W.....	,737	82,0	81,0	81,4	N.	,741	81,0	80,0	80,4	N.	1,53	1,64
,833	78,4	78,0	77,5	N.	,800	78,8	79,4	78,8	N.	,755	81,0	82,0	80,8	N. W.....	,777	80,4	80,5	80,1	N. W.....		
,881	79,9	82,2	81,0	S. E.	,833	81,9	87,0	84,8	S. E.	,800	84,0	86,7	84,5	W. S. W.	,813	83,0	83,8	82,2	S.........		
,939	80,5	86,0	83,8	W. S. W.	,906	83,4	89,7	85,9	W. S. W.	,850	86,0	88,0	84,6	S.........	,853	84,5	84,0	82,2	S. W.....		
																				0,23	0,27
30,065	82,0	85,8	82,7	N. W.....	30,038	83,5	88,0	85,0	W.	,970	85,5	87,9	86,0	N. W.....	,973	84,5	85,0	84,0	Calm, ...		

. B. The Observations marked with Asterisks, signifying that clouds intervened at the time, are not included in the mean 116, 2o.

ster by Troughton used prior to the 1st June 1844, Observations reduced to 32° Ft. = 29 493

Moon's Change.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Upper.	Lower.
		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		
	Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
	30,198	82,0	86,0	82,5	N. E.	30,150	83,2	86,4	83,8	E.	30,100	84,5	84,7	82,7	S. E.	30, ..	..	..	..	....		
	,233	80,0	82,8	80,6	E. ..	,190	82,0	82,3	81,4	E.	,133	82,5	84,5	83,2	E. ..	,141	82,5	82,2	82,0	S. E.		
☽	,222	73,4	82,4	79,4	N. ..	,185	81,0	84,0	82,0	N. ...	,125	82,0	84,8	83,0	N. E.	,138	82,0	83,0	82,0	N. E.		
	,202	79,8	83,0	80,2	N. ..	,166	82,1	86,5	83,0	N.	,086	84,0	86,8	83,7	N. ..	,091	83,0	84,0	82,0	N. ..		
	,162	81,0	84,2	81,0	N. W.	,113	83,8	87,0	83,0	N. W...	,033	83,0	86,0	82,5	N. W.	,038	82,5	82,2	80,5	Calm,		
	,181	79,5	83,0	79,5	N. ..	,138	82,0	86,5	81,0	N. E. ..	,090	83,5	85,0	80,0	N. W.	,102	82,9	82,0	77,0	N. ..		
	,218	79,0	83,0	79,0	E. ..	,181	82,0	86,5	81,4	N. W...	,134	83,4	85,5	80,6	N. W.	,134	82,7	82,0	79,8	N. ..		
	,218	78,5	82,0	78,5	E. ..	,153	80,4	84,7	80,0	N.	,073	82,5	84,2	80,6	N. W.	,073	82,0	81,2	80,0	Calm,		
	,118	79,0	82,1	78,6	N. W.	,070	81,0	86,0	80,8	W.	29,990	82,4	84,8	81,5	N. ..	29,993	82,0	81,0	79,0	Calm,		
●	,093	78,8	81,9	78,0	N. ..	,061	80,0	84,0	79,0	N. W...	30,009	81,0	83,8	79,8	N. ..	30,018	80,9	80,5	77,9	N. ..		
	,134	77,0	81,0	77,0	N. ..	,090	79,5	84,0	78,0	N.	,017	80,7	82,6	78,0	N. ..	,017	80,7	82,6	78,0	N. ..		
	,090	76,5	80,0	76,5	N. ..	,046	79,2	83,0	78,5	N. W.	29,981	80,5	83,0	80,0	N. ..	29,986	80,2	80,0	78,0	N. ..		
	,070	76,0	79,8	76,0	E. ..	,033	78,4	82,5	78,0	N.	,978	81,0	82,0	79,0	N. ..	,989	80,0	75,0	77,8	N. W.		
	,130	75,5	79,8	76,0	N. E.	,090	79,7	82,7	78,8	N.	30,026	80,0	83,0	80,2	N. ..	30,034	79,5	80,0	78,8	N. ..		
	,100	76,0	79,0	75,7	N. ..	,068	79,5	82,8	78,8	N.	,005	80,0	82,9	79,0	N. ..	,013	79,8	80,0	77,9	N. ..		
	,100	75,0	78,0	74,1	N. ..	,062	79,5	81,7	77,0	N.	,010	80,5	82,5	78,0	N. ..	,010	80,0	79,8	76,0	N. ..		
☾	,170	74,8	79,0	76,0	N. ..	,093	77,0	82,4	78,0	N. W...	,038	78,9	82,9	80,5	N. ..	,050	78,7	79,7	79,0	Calm,		
	,161	74,6	78,0	75,2	W. ..	,118	77,5	79,8	78,0	N. ...	,058	81,0	85,0	82,0	W. ..	,061	80,8	82,0	80,4	N. W.		
	,145	76,5	80,0	76,2	N. ..	,114	78,7	84,0	79,0	N.	,050	80,3	84,2	80,0	N. W.	....	..	..	..	....		
	,162	76,2	79,0	76,5	N. ..	,121	79,4	83,0	78,8	N.	,050	80,0	83,8	78,8	N. ..	,057	79,5	80,5	77,0	N. W.		
	,141	76,0	80,2	76,8	N. E.	,110	79,7	83,0	78,5	N. W...	,037	80,0	84,0	79,8	N. ..	,041	79,4	80,0	78,4	Calm,		
	,186	76,2	79,8	77,0	N. E.	,146	78,8	82,0	78,2	N.	,081	79,0	83,0	79,0	N. ..	,081	78,8	80,0	78,0	N. ..		
	,174	77,5	81,8	77,5	E. ..	,138	79,0	81,0	78,8	N.	,078	80,0	83,0	79,9	N. W.	,095	80,0	80,1	79,0	Calm,		
	,200	76,0	79,0	77,0	E. ..	,165	77,5	81,0	78,8	N.	,091	78,5	82,4	79,0	N. ..	,106	78,8	79,8	78,0	N. ..		
	,190	75,5	78,0	75,8	N. E.	,142	77,4	82,1	78,0	N.	,077	77,2	83,0	80,0	N. ..	,089	77,4	79,8	78,6	Calm.		
○	,170	75,4	79,0	76,0	N. W.	,134	78,0	83,2	79,0	W.	,045	79,9	84,0	80,9	N. W.	,050	79,5	80,4	78,8	w.s.w.		
	,118	75,5	79,0	75,5	W. ..	,069	79,5	84,0	79,0	W.	29,986	80,0	83,2	79,0	N. W.	29,990	79,5	80,0	78,0	N. W.		
	,050	74,9	78,5	75,8	w.s.w.	,029	79,4	83,6	79,0	WSW.	,977	82,0	84,5	80,6	W. ..	,981	81,1	80,8	79,8	Calm,		
	,110	73,9	78,0	74,0	N. W.	,066	77,5	84,0	78,8	N. W...	30,005	79,5	83,0	79,8	N. W.	30,013	79,1	80,7	79,2	N. W.		
	,115	74,2	75,2	72,6	E. ..	,073	77,2	80,2	77,4	W.	,013	79,8	82,0	78,8	N. W.	,018	79,4	78,5	77,0	N. ..		
	30,152	77,0	80,4	77,2		30,111	79,7	83,5	79,7		30,046	80,9	83,8	80,6		30,050	80,5	80,6	78,9			

Barom. by Troughton used prior to the 1st June 1844, Observations reduced to 32° Ft. = 29,46
" by Col. Everest used from 1st June to 31st August, ... Ditto .... = 29,6?
No. 52, Standard by Newman, (Diam=0,504 inches,) used from 1st Sept. Ditto ... = 29,6?

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of March 1844.

Moon's Changes.	Moon's Horizontal Parallax at Noon.	Observed at 9 H. 50 M.					Observations Made at Apparent Noon.					Observed at 4 P. M.					Observations Made at Sun set.					Rain Gauges.	
		Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.		
			Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Upper.	Lower.
		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inc
	57	29,978	75.6	78,8	72,0	N. E.	29,957	78.4	84,8	76,0	N. E.	29,886	82,0	88,0	78,0	W.	29,889	79,5	81,9	76,4	Calm, ...		
	57	,938	74,0	77,8	74,0	N. E.	,914	79,2	84,0	78,2	W.	,854	81,2	88,0	78,2	W.	,854	79,5	83,1	78,0	Calm, ...		
	58	,949	77,0	81,1	77,0	S. W.....	,926	79,5	88,0	80,4	S. W.....	,849	82,0	89,8	79,2	S.........	,849	82,5	83,8	76,0	S.........		
	59	,930	79,0	81,0	78,0	S. W.....	,900	83,0	88,0	81,5	S.........	,829	85,4	89,8	81,5	S.........	..	..	..	..	....		
☉	60	,940	76,7	77,0	73,0	S.........	,918	81,0	83,0	74,7	W.	,834	82,0	88,0	80,4	W.	,825	80,5	82,2	77,5	Calm.		
	60	,870	80,0	84,0	77,5	S. W.....	,850	85,1	90,2	79,4	S.	,778	86,2	94,0	82,0	S.........	,769	83,8	87,5	79,9	S.........		
	60	,894	81,0	83,0	73,7	W.	,881	84,5	90,0	80,0	N. W.....	,794	88,4	92,8	80,0	W. S. W.	,782	82,9	86,3	81,0	Calm, ...		
	60	,897	80,0	84,0	76,0	E.	,878	84,0	90,0	79,2	N.	,794	85,7	92,4	82,0	W.	,789	82,5	84,6	79,0	Calm, ...		
	60	,893	81,7	83,0	76,0	S.........	,865	86,0	92,0	79,1	W. S. W.	,780	88,0	93,8	81,0	N.	,790	84,5	89,0	80,0	Calm, ...		
	59	,890	80,0	84,8	78,4	S. E.	,862	85,7	92,7	80,9	W. S. W.	,785	85,2	96,2	83,0	N. W.....	,785	85,1	90,4	82,0	Calm, ...		
☽	59	,897	82,5	85,4	78,5	S.........	,873	89,4	93,8	82,0	W. S. W.	,797	91,4	97,2	82,6	W.	,800	85,8	89,7	79,0	S.........		
	58	,830	82,5	84,1	78,8	W. S. W.	,822	89,0	94,2	83,4	W. S. W.	,766	92,5	98,4	85,0	W. S. W.	,758	87,5	89,7	82,9	S.........		
	58	,848	85,1	89,0	82,0	E.	,838	88,1	95,0	86,0	N. E.	,754	88,8	95,9	85,5	S. E.	,746	85,6	89,6	83,0	Calm, ...		
	57	,861	83,5	86,8	80,6	S. W.....	,854	88,5	93,4	83,3	S. (high)	,785	88,3	92,5	81,0	S.........	,788	85,5	86,0	80,0	S.........		
	57	,845	82,0	84,4	80,0	S. W.....	,834	85,5	91,0	83,0	S. W.....	,762	88,2	91,0	82,0	S.........	,765	85,4	85,7	81,8	S.........		
	56	,898	81,4	83,0	80,0	S. W.....	,886	86,0	90,2	84,8	S.........	,813	89,5	94,2	86,4	S. W.....	,822	86,0	88,0	83,5	S.........		
	56	,890	81,9	84,2	81,0	S.........	,870	83,1	90,3	85,0	W.	,805	87,7	92,0	84,8	N. W.....	,809	84,5	87,0	80,0	W.		
	55	,850	82,0	85,0	78,0	S. W.....	,830	83,7	86,7	80,7	W. S. W.	,734	88,0	94,7	84,4	W.	,725	85,0	87,0	80,0	S.........		
●	55	,770	82,4	85,4	78.5	S. W.....	,759	88,2	95,0	85,0	S. W.....	,681	92,0	96,8	85,0	W.	,669	87,8	90,0	82,2	S. W. ..		
	55	,793	82,5	86,0	81,8	S.	,777	88,0	93,7	85,0	S.........	,718	88,5	98,0	88,5	S. W.....	,721	87,0	90,0	84,0	S.........		
	54	,778	83,4	86,0	81,5	S. W. high	,754	88,0	92,5	82,7	W. S. W.	,686	89,8	94,2	86,8	S.........	,686	87,0	88,4	83,0	S.........		
	54	,793	84,0	87,0	82,2	S. W.....	,781	89,0	94,5	88,0	W. S. W.	,720	88,0	89,0	85,0	S.........	,718	85,0	84,0	82,0	N. W.....		
	54	,830	84,0	87,0	82,8	S. (high)	,818	86,9	90,0	84,1	S.W. high	,789	83,5	84,2	81,0	S.........	,782	82,6	82,5	80,4	S.........		
	54	,838	80,0	79,8	79,0	S.........	,813	82,5	84,0	80,6	S.........	,748	83,5	86,0	82,0	S.........	,734	82,0	82,5	80,6	S.........		
	54	,793	82,0	85,8	82,0	S.........	,774	86,5	91,5	85,0	W	,721	88,0	94,0	87,0	S. W.....	,709	85,2	87,5	81,0	S. (high)		
	55	,817	84,0	87,2	82,1	S. W.....	,805	88,5	93,8	84,0	S. W.....	,721	89,0	94,0	86,0	S. W.....	,721	86,8	88,0	81,8	S.........		
☾	55	,854	83,5	87,0	83,8	S. W.....	,841	88,0	94,2	86,0	W. S. W.	,774	91,0	97,8	86,0	W.	,760	87,0	90,0	83,8	S. W.....		
	56	,7[illegible]8	86,0	89,7	85,0	S. S. W.	,738	94,0	96,5	87,0	S. S. W.	..	..	..	..	....	,622	88,4	90,0	84,5	S.........	0.15	0.

Moon's Changes.	Moon's Horizontal Parallax at Noon.	Observed at 9 H. 50 M.					Observations Made at Apparent Noon.					Observed at 4 P. M.					Observations Made at Sun set.					Gau[ge]
			Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.	
		Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Upper.
		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches
	61	29,723	87,5	91,5	87,0	S. W.	29,693	92,0	97,0	83,0	S. W.	29,618	90,0	94,0	83,0	S.	29,620	89,0	88,5	84,5	S.	
	61	,618	85,0	88,6	85,0	S.	,600	89.5	94.0	88,4	S.	,458	94,5	99,4	91,8	S.	,450	89,5	91,8	88,0	S.	
○	61	,597	88,8	92,5	82,0	W. S. W.	,582	90.6	99.4	85,0	W. (high)	,493	93,4	101,5	85,0	W. (high)	,493	92.1	94,8	85,0	S.	
	61	,650	88,0	92,0	82,8	S.	,642	93.4	98,6	85,0	W. (high)	,550	93,2	100,6	88,0	W.	,550	90.5	92.0	84.0	S.	
	61	,654	86,7	91,0	83,5	S. W. ...	,634	89.5	98,5	85,5	W.	,550	93,4	100,6	87,0	W.	,550	89,5	93,0	85,0	S.	
	60	,718	86,0	89,0	84,0	N. W.....	,706	90,3	97,0	85,0	N. E.	,629	91,5	99.8	87,5	S. W.....	,639	89,5	92.5	86,0	S.	
	59	,702	85,0	88,0	83,4	S. (high)	,686	90,2	95,8	87,4	S. (high)	,650	92,6	97,3	88.2	S. (high)	.650	88,6	89.8	85.2	S.	
	58	,794	85,2	89,0	84,0	S.	,785	88,8	93,8	86,5	S.	,702	90,9	94.0	88,2	S. W. ..	,708	88,0	87,0	84,0	S.	
	57	,816	84,8	88,4	84,0	S.	,800	89,0	94,0	87,0	S. W.	,690	87,8	88,6	85,0	S. (high)	.700	86,0	84,5	83,0	S.	
☽	56	,694	88,0	91,7	84,0	S. W.....	,673	93.0	101,5	87,0	W.	,557	92.1	101,9	88.0	N.	,557	89.5	95,0	82,0	N. W.....	
	56	,651	88,4	91.0	85.8	S. W.....	,642	88.0	100,0	86.0	W. S. W.	,553	90,8	100,5	85,2	S.W.(high)	....	..	..	..	....	
	55	,663	87,0	89.2	86,0	S.	,634	88.0	94.9	88.0	S.	,534	91,0	94,0	88,0	S. (high)	.541	88,0	86,7	84,0	S. (high)	
	55	,653	89,8	92,8	86,0	S. W.....	,625	88.8	100.0	86,0	W. S. W.	,541	91,5	94.5	85,0	S. (high)	,554	87,5	87,4	84,0	S. (high)	
	55	,594	83.8	85,2	83,4	N. E.	,681	88,0	92,7	87,0	E.	,597	90,0	92.7	86,4	S. E.	,594	89,5	86,0	82,5	S.	0,16
	54	,785	82,3	84,1	82,5	E.	,762	86,1	91,0	86,6	E.	,685	87,1	88,6	84,7	S.	,698	85,4	85,0	82,2	S.	0,70
	54	,834	85,6	87,9	84,0	S.	,817	87,4	90.0	84.0	S.	,724	89,5	93,0	85,9	S.	,737	87,6	88,0	83,6	S.	
●	54	,770	85.8	87,9	82,4	S.	.747	88,0	90.2	84.2	S. (high)	,665	90,0	92,5	85,3	S.	,665	89,5	85,2	85,0	S. (high)	
	54	,661	86,1	90,0	85,0	S. (high)	.641	87,2	94.2	83,4	S.W.(high)	,574	91,5	92,4	87,0	S. (high)	,582	88.2	87,5	84.2	S.	
	54	,670	87.2	89.0	84,6	S. (high)	,658	90.6	94.5	88.2	S.	,594	91,4	94,9	87,0	S.	,589	88,2	87,0	83,0	S. (high)	
	54	,690	87,1	89,8	85,0	S.	,681	90.4	94,9	87,2	S.	,625	92,0	95,0	88,0	S.	,613	88,0	86,5	83,8	S. (high)	
	55	,694	86,2	90.0	85.0	S. (high)	.681	84.2	92.0	85,0	S. (high)	,638	91,1	93,8	86,7	S.	,638	87,0	87,0	83.0	S.	
	55	,725	86,0	88.0	83,2	S.	,709	88.4	94.0	85.4	S.	,642	90.5	92.2	86,0	S. W.....	.650	88,0	88.0	82,8	S. E.	
	56	,697	86,0	88,0	82,7	S. (high)	,681	88,5	93.7	85.9	S. (high)	,630	90,1	92,8	84,5	S. (high)	,594	87,8	86,0	81,8	S. (high)	
	57	,657	85,9	88,5	83,0	S. (high)	,653	87,5	91,0	82.0	S. (high)	,593	88,1	91.0	84.0	S.W.(high)	.600	86,0	87,0	85.0	S.	
	57	,709	86,4	89,0	83,0	S.	,693	88,5	92.5	85,0	S. (high)	,653	88.0	90,4	84,0	S.	,662	86.0	85,9	80,9	S.	
☾	58	,786	85.9	90,0	84,0	S.	,765	89,4	92,0	83.2	S.	,670	89,0	93,0	86,0	S.	,675	86.0	86,0	82,0	S.	
	59	,770	85,9	90,0	84,0	S.	.749	89.0	92,3	83.0	S.	,660	87,3	86,0	81.0	S.	,674	85,4	80,0	77,0	S. W.....	0.28
	60	,718	85.0	86,0	81,0	S.	,700	85.5	87,9	81.2	S. (high)	,618	87,2	89,0	81,0	S. (high)	.625	86,0	85,0	80,4	S.	1,15
	61	,781	82.3	84.0	81,0	S. E.	.757	85.4	87.0	82.0	S.	,677	84,0	85,0	82,2	S. E.	,690	83.0	82,0	80,7	N. E.	0,20
	61	.798	83.0	84.9	83,4	N. E.	.732	83,8	84,5	81,5	S. E.	,702	84,0	85,0	81,9	S.	,697	83,6	84,0	82,0	S. E.	0,14

Moon's Horizontal Parallax at Noon.	Observed at 9 H. 50 M.					Observations Made at Apparent Noon.					Observed at 4 P. M.					Observations Made at Sun set.					Rain Gauges.	
	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.	Barometer.	Temperature.			Wind.		
		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.		Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Upper.	Lower.
	Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
61	29,734	84,0	86,0	83,0	S.........	29,702	87,4	90,7	85,7	S.........	29,585	87,2	88,0	84,0	S.........	29,602	85,2	84,6	82,5	S.........	0,08	0,13
61	,685	80,5	81,9	80,0	S.........	,669	82,9	85,9	81,2	S.........	,554	85,5	87,4	84,0	S.........	,573	84,0	83,0	80,9	S.........		
61	,679	85,1	88,0	84,5	S.........	,675	88,8	92,0	85,9	S.........	,569	89,9	92,0	87,0	S.........	,582	87,0	86,8	83,0	S.........	0,33	0,45
61	,693	84,5	86,9	85,0	S.........	,678	87,5	92,1	87,2	S. W.....	,594	90,0	94,5	88,7	E.	,578	87,5	89,5	86,0	E.		
60	,620	86,2	89,0	86,0	S. W.....	,602	88,2	92,5	86,8	E.	,533	91,0	96,0	89,0	S. E.	,533	89,0	91,0	86,5	Calm, ...		
60	,582	87,8	91,0	86,0	S.	,570	90,8	96,0	87,9	S.........	,505	92,3	96,0	88,4	S.........	,520	87,1	86,0	83,7	S.........		
59	,589	87,4	90,0	85,5	S.........	,582	90,2	95,0	88,1	S.........	,542	92,0	94,0	87,5	S.........	,553	89,0	88,7	85,0	S.........		
58	,642	88,0	91,0	87,0	S. W.....	,641	91,4	95,2	88,0	S.........	,569	92,1	94,5	88,0	S.........	,575	89,0	89,7	88,6	S.........		
57	,646	87,5	90,5	85,0	S.........	,641	90,6	94,0	86,0	S.........	,545	93,4	96,7	88,0	E.	,542	88,9	88,2	83,0	S.........		
56	,602	87,0	90,3	85,4	S. E.	,593	90,5	94,0	86,5	E.	,510	92,5	96,0	87,0	E.	,510	89,4	88,9	83,8	S. E. ...		
56	,589	86,2	88,0	84,0	E.	,574	90,1	93,8	86,0	N. E.	,506	89,7	90,3	86,0	E.	,513	87,8	86,2	83,0	E.		
55	,602	85,0	85,0	80,0	N. E. ...*	,592	86,5	87,2	81,0	N. E.	,513	88,2	91,0	84,8	N.	,522	87,8	89,0	87,0	N. E.	0,26	0,34
55	,600	79,3	78,0	77,9	S. E.	,600	85,0	87,8	85,0	S. E.	,542	81,4	80,9	88,0	S. E.	,565	82,8	80,5	80,0	S.........	0,17	0,24
54	,673	86,0	89,0	86,0	S. (high)	,658	89,0	92,0	87,2	S. (high)	,606	90,0	92,0	86,4	S.......	,610	87,0	89,0	84,9	S.........		
54	,678	87,8	90,0	87,6	S.........	,660	90,3	93,8	90,0	S. (high)	,600	90,4	92,2	89,0	S.........	,608	88,5	87,5	86,0	S. E.	1,04	1,17
54	,690	85,0	87,0	85,0	S.........	,672	88,0	91,0	88,0	S.........	,590	89,0	90,7	86,8	S.........	,605	88,0	87,0	85,0	S....*....		
54	,722	85,4	88,5	87,0	E.	,681	89,4	92,5	88,0	S.........	,594	90,5	92,0	86,0	S. W. high	,605	87,8	87,0	85,0	S.........		
54	,690	86,8	89,4	86,6	S.........	,672	89,0	91,0	88,1	S. W.....	..	*..	75,0	75,4	S.........	,589	81,8	78,6	78,6	S.........	1,72	1,86
54	,650	84,4	86,5	85,0	S.........	,632	82,2	79,0	79,0	S.........	,574	84,8	86,5	85,5	S.........	,574	83,8	83,0	81,8	S.........	0,31	0,38
54	,602	86,3	89,0	86,9	S.........	,587	87,5	88,9	88,0	S.........	,538	83,9	84,8	84,8	S. E.	,550	84,5	84,0	84,0	S.........	0,18	0,24
55	,590	86,0	88,5	86,8	S.........	,569	86,4	89,4	87,5	S.........	,500	88,0	89,2	86,5	S. E.	,500	84,9	84,2	83,4	E.	0,90	1,07
55	,420	80,5	79,0	79,0	N. W...*	,498	80,8	80,0	80,0	N. W.....	,443	81,5	80,4	80,0	W.	,448	82,0	80,0	80,2	W.		
56	,505	85,8	88,0	86,0	S. W.....	,486	87,8	92,0	88,7	W.	,410	90,4	94,5	88,9	N. W.....	,425	85,0	82,2	80,4	W.		
57	,438	86,5	90,0	88,0	S.........	,436	89,0	93,8	91,0	S.........	,395	92,0	95,0	92,0	S.........	,385	88,7	90,0	89,0	Calm, ...		
57	,518	88,0	90,0	88,0	S.........	,509	91,0	94,5	90,9	S.........*	,457	91,4	93,0	89,8	S. E.	,469	88,8	90,0	88,0	S.........		
58	,546	88,0	92,0	90,0	S.........	,540	90,5	94,5	91,5	S. W....*	,450	90,5	92,4	90,0	S.........	,440	86,4	79,0	78,0	N.	0,39	0,50
59	,590	87,1	89,0	87,2	S.........	,578	89,5	92,0	88,4	S.........	,502	89,9	90,0	87,0	S.........	,510	87,0	86,0	85,0	S.........	0,06	0,09
60	,573	87,8	90,0	88,0	S. W.....	,573	90,0	93,8	90,0	S. W.....	,514	90,9	93,0	89,8	S. W.....	,535	89,0	86,7	85,2	S.........		
[illegible]	,621	87,0	88,6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							

N. B. The Observations marked with Asterisks signifying, that clouds intervened at the time, are

Moon's Horizontal Parallax at Noon.	Observed at 9 H. 50 M.					Noon.					Observed at 4 P. M.										Gauges.	
		Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.		
	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Upper.	Lower.
	Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
61	29,637	86,0	86,0	84,0	S. W.	29,621	89,7	92.0	89,0	S.	29,534	84,0	83,0	82,0	S.	29,541	85,4	80,8	80,7	S. E.	0,18	0,29
61	,585	86,8	89,8	87,0	W.	,574	88,0	88,5	87,0	E.	,595	85,5	84,0	83,9	N. E.	,495	84,4	78,0	77,9	N. W.	0,92	1,01
60	,618	82,5	81,4	81,0	N. E.	,590	84,0	84,0	82,6	N.	,522	85,5	85,5	84,4	N. E.	,509	85,0	84,3	84,0	Calm,	..	..
59	,597	85,4	86,0	84,9	N. W.	,573	87,5	89,0	87,0	N. W.	,490	90,0	92,5	88,7	E.	,518	88,5	88,7	87,0	E.	0,24	0,34
58	,610	87,0	88,0	85,0	W.	,581	89,8	91,9	88,0	W. S. W.	,510	91,5	92,0	88,5	S.	,534	87,5	86,0	84,5	S.	0,39	0,48
57	,614	83,0	81,8	80,9	Calm,	,598	84,4	84,2	83,1	S.	,529	87,5	87,2	85,0	S.	....	..	..	..	....	1,64	1,84
56	,614	84,5	84,0	83,0	S. W.	,593	85,8	85,8	84,5	S. W.	,520	86,9	86,7	84,8	S. W.	,554	85,7	84,6	84,0	S.	..	..
56	,646	85,0	84,8	83,0	S. W.	,642	86,0	85,5	84,0	S. W.	,570	87,9	87,8	85,0	S. W.	,581	85,5	85,0	84,4	S.	1,66	1,95
55	,652	85,0	85,3	83,0	S. (high)	,657	86,2	85,8	84,0	S. (high)	,585	86,9	86,2	85,0	S.	,595	85,0	85,0	84,0	S.	..	..
54	,693	87,9	88,0	85,7	S.W. high	,670	90.0	90.3	87,9	S.	,630	89,0	88,7	87,0	S.	,638	87,0	85,8	85,0	S.	..	..
54	,721	87,0	88,0	86,0	S.	,700	90,0	90,5	87,4	S. W.	,618	91,0	91,8	88,9	S.	,638	88,0	86,0	85,0	S.	..	..
54	,754	87,0	88,0	86,0	S. W.	,734	90,9	91,0	88,0	S.W. (high)	,645	90,3	90,8	88,0	S.	,650	87,4	86,0	83,0	S.	2,58	3,27
54	,753	85,0	85,4	82,2	S. W.	,760	87,5	88,4	85,0	S. W.	,677	89,8	89,2	86,0	S.	,700	87,1	85,0	83,0	S.	0,24	0,30
54	,773	85,5	85,6	84,7	S.	,769	88,6	88,7	85,9	S.	,693	89,0	89.0	86,0	S. W.	,689	87,0	85,5	83,2	S.	..	..
54	,793	87,0	88,0	85,0	S.	,786	89,0	90,0	86,0	S.	,710	90,5	90,0	86,0	S.W. (high)	,729	87,0	85,9	83,1	S.		
55	,834	87,0	88,0	85,2	S. W.	,805	90,0	92,0	88,0	S. (high)	,737	89,5	88,9	85,0	S.	,734	88,0	86,3	84,0	S.		
55	,840	88,0	89,0	86,0	S. W.	,802	90,0	91,9	87,2	S. (high)	,726	91,0	90,7	86,1	S.	,760	89,0	87,0	84,0	S.		
55	,838	88,0	89,0	85,4	S. W.	,830	90,5	92,0	87,9	S. (high)	,730	90,5	90,0	86,0	S.	....	..	..	..	....		
56	,770	88,0	89,4	86,1	S. (high)	,761	90,5	91,7	88,0	S. W.	,639	91,2	91,8	88,0	S. W.	,698	87,7	87,0	84,6	S.		
56	,682	88,5	90,0	86,0	W.	,657	90,8	92,0	86,5	W. S. W.	,617	92,5	94,6	89,0	S. W.	,625	90,0	89,0	86,0	S.		
57	,662	88,4	88,6	86,8	S.	,658	91,0	92,2	88,4	S.	,585	89,8	90,0	86,0	S.	,629	89,1	88,7	84,8	S. E.		
58	,674	88,0	89,0	85,8	W.	,661	89,5	91,0	85,4	N. E.	,606	85,4	84,0	82,8	Calm,	,600	85,8	82,7	81,4	S.	0,80	0,92
58	,654	85,5	89,5	86,7	E.	,622	90,0	93,0	87,4	E.	,557	91,0	93,4	88,0	E.	,561	88,8	90,0	88,0	Calm,		
59	,629	85,5	86,5	83,0	W. S. W.	,585	88,0	90,0	85,0	S. W.	,514	89,4	88,7	81,4	W.	,521	88,6	88,4	85,0	Calm,	0,08	0,18
60	,614	84,0	82,9	81,4	S.	,586	86,0	86,0	83,0	W. S. W.	,526	90,0	90,9	85,7	S. W.	,560	87,7	86,0	84,7	S.	0,81	0,94
60	,629	88,8	89,5	87,0	S. W.	,581	92,0	93,0	88,0	S. W.	,513	90,4	90,0	87,0	S.	,517	87,0	84,0	82,2	S. W.		
61	,622	86,5	88,0	85,0	Calm,	,610	88,2	87,0	83,0	N. W.	,554	83,9	82,8	81,0	S. E.	,532	82,9	80,0	80,0	Calm,	0,05	0,06
61	,589	86,0	87,5	85,0	N. E.	,566	88,7	92,0	87,0	N. E.	,470	90,5	92,7	87,0	E.	,502	88,0	85,5	83,3	S. E.		
61	,558	87,0	87,0	83,5	N. E.	,541	87,5	88,0	84,7	E.	,445	88,0	88,0	84,3	E.	,493	85,8	82,6	81,0	S. E.	0,18	0,28
60	,700	84,0	83,8	81,9	S. E.	,686	84,4	84,7	83,0	S. E.	,660	85,2	85,1	84,0	S.	,670	84,8	82,5	81,0	S.	0,18	0,27
																					9,95	12,13

N. B. The Observations marked with Asterisks signifying, that clouds intervened at the time, are

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of January 1844.

Moon's Horizontal Parallax at Noon.	Observed at 9 H. 50 M.					Observations Made at Apparent Noon.					Observed at 4 P. M.					Observations Made at Sun set.					Rain Gauges.	
		Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.		
	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mercury.	Of the Air.	Of an Evapg. Surface.	Direction.	Upper.	Lower.
	Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
54	29,893	68,0	74,0	68,5	W.	29,862	70,2	77,8	70,2	W.	29,834	72,5	79,8	72,0	N. W.	29,834	71,7	76,0	72,0	Calm,		
55	,970	70,0	75,0	71,0	N.	,930	71,0	80,0	72,5	W.	,873	74,0	80,5	73,5	N. W.	,889	73,0	76,4	72,0	N. W.		
55	30,010	68,8	72,0	68,0	N.	,970	72,4	78,5	72,0	W.	,904	74,1	79,0	72,2	N. W.	,906	73,1	76,0	72,0	Calm,		
55	,002	71,2	74,4	70,0	W.S.W.	,973	74,8	79,0	71,0	W. S. W.	,890	74,4	80,0	73,0	W.	,895	73,5	76,2	73,0	Calm,		
56	29,938	70,2	72,2	68,6	N. W.	,914	73,8	78,1	72,6	N.	,878	75,1	79,0	72,1	N. W.	,874	73,0	76,0	72,0	Calm,		
56	,982	70,5	71,0	69,0	N. W.	,945	75,2	79,8	74,0	S.	,894	76,0	83,0	74,7	W. S. W.	,881	74,5	78,0	74,0	Calm,		
57	,909	73,0	75,0	71,8	S. (high)	,886	74,5	79,0	73,0	S. (high)	,845	76,0	80,4	73,8	S. (high)	,853	74,6	75,0	71,0	S.		
58	,950	68,8	70,0	67,1	N.	,917	72,5	75,0	70,0	N.	,886	73,9	78,6	70,0	N. W.	,886	73,4	74,7	69,0	N.		
59	30,094	66,8	68,2	63,0	N. (sharp)	30,062	70,2	72,5	66,1	N. (sharp)	30,006	72,0	76,0	70,2	N. E.	30,013	70,8	71,0	67,0	N.		
59	,053	66,0	68,5	63,0	n. e. sharp	,022	69,0	72,0	66,0	N.	29,974	70,4	75,0	69,8	W.	29,984	70,0	70,2	67,8	N. W.		
59	,050	64,4	66,5	62,0	N. E.	,022	68,5	72,5	66,2	N. W.	,966	70,3	76,0	70,0	N. E.	,970	69,5	71,0	67,0	N. E.		
59	,074	65,2	66,0	61,8	N. E.	,029	67,8	70,3	64,7	N.	,993	67,8	68,8	64,0	N.	30,006	67,5	67,0	64,0	N.		
59	,118	67,2	69,0	65,7	N. E.	,082	70,0	74,0	69,0	N.	30,029	71,0	75,0	69,8	N.	,037	70,9	72,1	69,8	N. E.		
59	,106	69,5	72,2	68,0	N. E.	,045	69,3	76,0	70,0	N.	29,982	70,5	76,7	[illegible]	N. E.	29,995	70,0	73,0	69,0	N.		
59	,130	65,5	66,3	61,0	N. (sharp)	,070	68,5	72,0	64,5	N. (sharp)	,993	68,6	73,8	66,5	N. (sharp)	30,005	67,0	70,0	65,0	N. (sharp)		
59	,149	62,7	64,6	59,1	N. (sharp)	,113	66,5	70,9	64,0	N.	30,038	68,1	72,8	65,8	N. W.	,050	67,5	68.5	63,8	N. (sharp)		
59	,153	63,5	65,0	60,0	N. (sharp)	,093	66,9	71,0	65,0	N. (sharp)	30,017	68,5	74,5	67,7	N. W.	,017	67,8	70,4	66,0	N.		
59	,113	63,3	66,0	61,0	N. W.	,062	68,7	73,0	66,9	N.	29,997	72,3	76.4	74,0	N. W.	29,935	68,5	72,9	67,1	N.		
58	,034	65,0	67,8	63,0	N.	29,998	68,0	74,5	68,1	N. W.	,954	69,1	77,0	69,8	W.	,954	68,0	72,0	67,2	Calm,		
58	,013	67,0	68,8	65,0	N. E.	,965	68,8	75,9	70,0	N. E.	,917	69,5	78,8	71,0	W.	,922	73,0	73,8	70,0	Calm,		
57	,005	68,0	72,2	67,0	N.	,969	68,5	78,4	70,0	N.	,930	68,5	80,0	71,8	W.	9,34	68,4	74,0	70,2	Calm,		
56	,026	67,0	68,0	64,0	N.	,989	69,0	77,0	71,0	N. E.	,929	70,6	78,0	71,0	N.	,930	69,8	73,1	70,0	N.		
56	29,957	68,0	70,5	66,0	N.	,930	69,9	77,8	70,6	N. W.	,886	70,5	80,0	72.0	N.	,886	69.5	74,6	71,0	Calm,		
55	,938	68,0	73,0	67,0	N. W.	,921	74,0	79,0	72,0	S. E.	,854	75,8	81,0	73,0	S.	,846	73,8	76,5	72,0	Calm,		
55	,854	70,4	71,9	77,0	W. S. W.	,833	75,6	79,9	72,5	W. S. W.	,778	77,0	84,0	76,0	W.	,778	74,4	77,2	72,0	S.		
54	,865	72,0	72,0	69,0	W.	,846	72,8	76,0	72,0	N. W.	,774	74,0	77,0	74,0	Calm,	,772	72,4	74,4	72,2	Calm.		
54	,869	70,9	70,2	69,0	N. E.	,850	73,0	75,8	72.0	E.	,793	75,8	78,4	73,0	S. E.	,792	73,4	75,0	70,8	S.	0.20	0.22
54	,873	7?,5	74.8	71,0	S.	,862	71,8	75,0	72,5	N.	,774	74,0	79,0	74,8	S.	,776	73,1	76,4	74,0	E.		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

Moon's Changes.	Moon's Horizontal Parallax at Noon.	[illegible] Barometer.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of an Evapg. Surface.	Wind. Direction.	Noon. Barometer.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of an Evapg. Surface.	Wind. Direction.	Observed at 4 P. M. Barometer.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of an Evapg. Surface.	Wind. Direction	Observations Made at Sun set. Barometer.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of an Evapg. Surface.	Wind. Direction.	Rain Gauges. Upper.	Rain Gauges. [Lower]
		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inc
	56	29,970	69,3	72,0	66,5	W. S. W.	29,952	73,0	80,0	72,1	W. S. W.	29,898	76,5	81,0	71,0	S. W.	29,902	73,0	75,0	70,0	S.		
	56	,973	69,0	69,1	68,0	N. E.	,958	71,4	73,1	70,0	E.	,930	73,0	74,1	70,0	S. E.	,932	71,2	72,0	69,0	Calm,		
	57	,990	69,5	71,8	68,2	N.	,958	73,6	76,8	71,0	N. W.	,894	74,5	78,0	72,5	W.	,894	73,0	74,0	71,0	N.		
○	58	30,018	67,4	70,4	67,0	N.	,998	69,4	74,0	68,8	N.	,965	71,7	74,1	69,0	N.	,966	70,5	72,0	67,2	N.		
	58	,062	68,5	70,4	66,0	N.	30,045	71,4	75,4	70,0	N. E.	,994	72,5	78,0	71,8	N.	,998	71,7	74,0	70,0	N.		
	59	,098	68,1	70,3	65,0	N.	,054	71,3	75,5	69,0	N.	,989	74,0	80,5	72,0	N.	,993	71,5	74,5	70,2	Calm,		
	59	,042	69,0	73,0	68,0	N. E.	,014	72,1	78,5	71,9	N. E.	,934	75,0	82,8	74,0	N.	,934	73,0	77,0	72,0	Calm,		
	59	29,958	70,0	75,0	69,0	N. E.	29,934	73,9	81,0	74,2	N. E.	,865	78,8	84,6	76,0	N.	,854	73,8	80,0	74,0	N.		
	59	,897	73,6	77,0	71,8	N. W.	,878	78,0	84,0	76,0	N.	,822	81,5	84,8	77,0	N.	,824	79,0	80,4	75,8	Calm,		
	59	,974	70,8	72,5	69,0	N.	,954	74,0	79,8	74,0	N. W.	,870	75,1	82,0	76,0	N.	,874	74,5	78,0	74,0	N.		
☽	59	30.045	70,0	70,0	65,0	n. w. sharp	30,017	71,0	74,0	66,2	N. (sharp)	,948	72,5	77,8	68,4	N. W.	,948	72,0	74,0	66,0	N.		
	59	,022	68,0	70,0	64,0	N. (sharp)	29,993	71,5	74,0	66,1	N. (sharp)	,917	73,8	79,0	70,0	N.	,921	72,5	75,1	68,5	N.		
	59	,025	68,2	72,0	65,8	N. (sharp)	,982	72,0	76,0	67,8	N. (sharp)	,906	76,2	81,8	71,0	N. W.	,912	73,3	76,0	70,2	N. W.		
	58	,040	70,0	72,0	67,0	W.	30,006	75,8	79,8	71,9	N.	,930	75,6	82,5	73,0	W.	,930	73,4	77,0	73,0	Calm,		
	58	,006	71,9	74,7	69,0	W.	29,974	77,1	82,7	74,5	N.	,900	80,7	83,0	77,0	N. W.	,890	75,2	80,0	72,8	N. W.		
	58	29,989	72,0	75,0	68,0	N.	,945	76,4	80,7	71,0	N. W.	,869	77,9	83,0	73,2	W.	,858	74,8	77,0	72,5	Calm,		
	57	,950	71,1	74,0	69,0	N.	,946	76,2	81,8	73,5	W.	,880	79,8	84,2	75,3	W.	,877	76,2	79,8	73,0	W.		
●	57	,914	72,6	76,9	72,2	W. S. W.	,902	75,5	84,0	82,9	W. S. W.	,838	78,4	88,0	77,0	S.	,849	77,0	80,0	74.0	S.		
	56	,969	74,0	75,0	72,8	S.	,950	79,0	84,0	78,2	S.	,882	81,2	87,8	79,3	W.	,873	76,5	81,9	76,0	Calm,		
	55	,974	75,0	77,3	74,0	W. S. W.	,950	80,2	84,4	77,0	S.	,870	82,0	89,0	78,0	W.	,870	79,9	82,0	75 0	S. W.		
	55	,882	76,0	79,0	75,0	S. (high)	,869	82,0	86,0	79,3	S. W.	,798	82,0	85,3	79,0	S.	,803	79,3	79,0	73,2	S. W.		
	55	,894	76,0	78.0	75,0	W. S. W.	,875	80,0	86,2	80,6	N. W.	,793	83,0	93,0	82,4	N. W.	,802	81,0	81,8	78,2	W.		
	55	,961	77,0	79,8	75,2	S. W.	,930	81,0	87,0	80,0	W.	,874	84,0	92,0	80,0	W. S. W.	,870	80,5	85,9	80,0	Calm,		
	54	,970	73,0	74,7	72,5	W. S. W.	,954	80,2	85,0	79,8	W. S. W.	,884	83,4	92,2	80,2	W.	,881	80,5	85,0	79,9	Calm,		
	54	,942	76,8	78,2	75,0	W.	,918	79,4	86,4	81,0	S.	,830	82,0	92,0	74,0	W.	,830	81,0	85,0	79,0	Calm,		
☾	54	,900	79,2	82,2	76,2	W. S. W.	,873	84,0	90,0	81,0	W. S. W.	,782	87,0	91,0	82,0	W. S. W.	,782	81,9	87,8	79,0	S.		
	55	,855	80,0	81,7	77,0	S.	,846	85,0	89,0	80,5	S. W.	,770	85,4	90,0	80,0	S.	,781	83,0	84,4	78,8	S.	0.05	0.0
	55	,930	78,4	80,0	77,1	W. S. W.	,897	82,5	86,5	80,2	S.	,805	84,3	88,0	81,0	S. W.	,805	81,4	82,0	78,0	S.		
	56	,941	75,8	76,0	71,5	N.	,930	78,8	82,2	74,0	N.	,854	81,0	86,0	77,0	N. W.	,857	79,5	80,6	75,2	Calm,		
		29.973	72.4	74.1	70.3		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			

THE JOURNAL

OF THE

Agricultural & Horticultural Society

OF

INDIA.

A Diary of Chinese Husbandry, from Observations made at Chusan in 1843-44, illustrated by drawings of the Implements of Agriculture. By ALEXANDER GRANT, *Esq. Bengal Medical Service.*

"And he gave it for his opinion, that whoever could make two ears of corn, "or two blades of grass to grow upon a spot of ground, where only one grew before, "would deserve better of mankind, and do more essential service to his country, "than the whole race of politicians put together."

April.—Week ending 9th April, 1843.—Rice fields being ploughed over, and rice beds for seed plants prepared. These beds undergo several ploughings, and after being flooded, and worked up into a state of mud by heavy three-pronged rakes, are made as level and smooth as a billiard table, the seed previously steeped in water, or water and urine, is now thrown in by the hand, the sower distributing it thickly, but very equally. Exactly one inch of water is left on the surface, and small channels are made, so as to keep the water always at the same level; the ground is highly impregnated with the liquid manure, and the water which forms the only covering to the seeds, holds urine in solution.

Large fields of mustard in bloom, and the trefoil and lupine attaining their full development. Peas and beans in bloom, and barley springing into ear.

16*th.*—Ploughs at work every where at the rice fields, only one small bullock or buffaloe is used, but although the soil is heavy, and very wet, the furrow turned up is clean, and fully as deep as that by European draught horses. The manures now in use are cow-dung, the coal black deposit from canals, and the liquid composition in its fermented state. In procuring the second of these, many boats may be seen on the canals, with two men in each; the instrument employed resembles a pair of antique snuffers, and is formed by attaching to the extremities of two long bamboos a couple of scoops either of wood or iron, which may be opened or shut at pleasure by connecting the bamboos about their upper third. The fields to which the cow-dung and coal deposit were applied had not been under green crop. Small patches of trefoil are being ploughed in,—the process is as follows: The field is thoroughly ploughed, it is next flooded, and thereafter harrowed with a heavy machine having two rows of horizontal and concave knifes fixed in the cross bars of a substantial frame-work, and to add to the weight the bullock driver stands upon the frame. This harrow is dragged through the field in every direction until the roots and stalks of the plants are effectually cut up, and in a measure incorporated with the soil, in which they soon enter into new elements through the process of decomposition, accelerated by the heat and moisture. Mustard springing into seed, and the flowers of the lupine opened, that of the trefoil scarcely. Wheat, buck, barley, and bean in full ear, and a crop of green vegetables being housed. The rice seed rising above water, and showing its green coat, other rice beds in course of preparation. Fields being reploughed across former ridges, and manured. Mustard in the full seed, and lupine being cut for ploughing in; the trefoil not yet complete. Dun oats on the slopes and summits of hills in a loose, poor and dry soil, the crop short, and altogether inferior, it is now in ear. Beans and peas in the market.

30th.—The rice in the seed beds about two inches high, fields being turned over, and some trefoil cut, and harrowed in as already described. Peas, beans, and cherries in the market. Rice beds still being prepared.

May, 7th.—This has been a very busy week, all hands having been employed from dawn till long past sunset, cutting the trefoil and lupine, and harrowing it in; not more than one-third is left to enrich the soil in which it grows, the remaining two-thirds being carried to other fields, from some of which a crop of mustard has been only just removed. Considerable quantities of beans have also been ploughed in without removing the pods, as these have ground in a rich moist soil the stalks are high and the foliage abundant. The weather has been often close and sultry, and the temperature equable; decomposition has been active, and the smell arising from the decomposing vegetables is very strong; many of the fields show the carbonized matter floating on their surface. The transplanting of the rice has commenced; the plants are about six inches in height, they are removed from the seed beds in small bundles, and carried in baskets to the fields; these fields have been finely worked up, smoothed and flooded, after which the plants are set in by the hand in rows about twelve inches apart. Wheat, buckwheat, and bean becoming yellow in the ear, and the mustard pulled up and stocked to dry. Peas and beans becoming too old for the table.

27th May.—The two past weeks actively employed in ploughing and preparing fields, and planting rice; during the last few days a second plantation of rice plants has been put in, previous to which the fields had been weeded, well irrigated, and the soil and water thoroughly stirred up. This process seems equivalent to the hoeing of other crops, and is performed by a flat square piece of wood set with short wooden teeth, and fixed to the end of a long piece of bamboo. The mustard seed has been dried, beaten out, and

winnowed, much bean and barley cut down, dried and beaten out on the field, the straw stocked in preparation for stacking. Beans cut and dried for seed and domestic use. Indian corn raised in beds, and transplanted into ground from which mustard had been removed; this ground had been well ploughed, broken, and set up into beds by three-pronged rakes, and manured from the farm yard. Green peas pass out entirely with this month, and are succeeded at our table by a tolerable good species of French bean.

May.—The highest range of the thermometer has been 80°, the lowest 48°. The greatest range in 24 hours 15°. Upon the whole the temperature and weather have been favorable to vegetation, with rain more than sufficient to keep the canals filled, although not enough to supply the rice fields without drawing upon the stock in the canals.

June 7th.—The whole of the grain crop has been nearly got in, the seed removed from the ear, and the straw stacked. The weather has been particularly favorable for these processes, but the farmers dread the long continued drought, as it may endanger the rice crop, and it requires their utmost exertions, by means of constant irrigation, to keep the soil under water. In taking a survey of the vallies, hundreds of wooden chain pumps* may be seen thus employed, and each worked generally by only one hand—other labourers may be observed stirring up the soil with the water after the manner already described, which is said to have a fertilizing effect, and may also retard evaporation. There is rising a fine crop of cucumbers and melons in the sheltered faces of the hills, in light soil, having a warm southern exposure, and in the low grounds, planted in ridges, are extensive fields of brinjals, a vegetable in much favor.

14*th.*—During the early part of this week, the whole native community became much alarmed at the prospects of the season; rice advanced considerably in price, and a

* Plate vi. fig. 3.

famine seemed impending. The canals were pumped dry, many of the fields beginning to crack, and the plants showing in some places a withered top. With the exception of a slight shower on the 1st instant, there had not been a drop of rain for a fortnight, and the weather being particularly dry and hot, was consequently favorable to evaporation. On the evening of the 10th, there were some electrical phenomena observed, but followed only by a slight shower. Had it not been for the large supply of water in the canals, the rising crop must have long ere this time been completely destroyed; human exertion could not procure water; earnestly therefore did they appeal to their Gods, and often have I seen the aged and experienced anxiously scanning the setting sun for the indications of the blessed shower. The morning of the 11th was calm, close, and sultry, and towards evening there were thunder and lightning, accompanied with heavy rain. For the three following days it rained almost continually; the canals were filled, and the air was for weeks afterwards loaded with moisture, so as to affect very strongly all articles of iron, leather or woollen; vegetation now made rapid strides, and the appearances of the failure which were so threatening, have at this time (25th June) completely passed away.

July.—The whole of this month has been dry, clear weather, and at times very sultry, the nights close and calm; particularly towards morning, with heavy dews, and forming altogether a temperature equable and highly favorable to vegetation. Some rice and vegetables were laid down at its early part upon spots of ground, from which wheat, barley, and mustard had been removed. Many of those, generally the youths of the family, have been employed to keep the rice fields under water, and others weeding them as it becomes necessary; the weeds are pulled up by the hand, thoroughly twisted, and buried at the roots of the plants; the labourer wades along in the mud often on his knees

having his face protected by a shield made of bamboo twigs; he will continue at this toilsome work from the earliest dawn until long past sunset, that is from five A. M. until about 7 P. M. But the chief occupation has been the care of vegetables and fruits, which are in great abundance, all this month. The brinjals of good quality are very extensively cultivated, as are also cucumbers, pumpkins, and several kinds of excellent melons. Indian corn in small patches is now in seed; also millet and another grain very similar to it, and used in the distillation of spirits. Of fruits, we have apples, pears, peaches, plums, all indifferent; but the first the best. The Chinese do not take much pains to improve the qualities of their fruits, for which they have no great partiality, but choose rather to bestow their labour upon grain and vegetables, and of the latter, they consume immense quantities. Lieutenant Colonel Warren, H. M.'s 58th Regiment, has raised potatoes in the immediate neighbourhood of the barracks, they have turned out tolerably productive, are sweet, but waxy. No doubt the loose dry soil on the sides of the hills (a disintegrated gneiss) would be more suitable to their habitude, than the low damp ground in which they have been grown.

August 1st.—To-day, I have for the first time observed the sickle applied to the rice crop, a small bill hook is used, (see plate) and when a bundle is cut, the reaper conveys it to a square tub enclosed on three sides by a mat screen; against the side of this tub the grain is beaten out, and when it is sufficiently filled it is borne off the field, it is water-tight, and having a round bottom, it can be easily slid along the muddy flats. The straw is piled up in bundles, much after the manner of our sheaves, and when dry, it is carried to the farm yard, and stocked. The principal occupation of the farmer this month has been the reaping and thrashing the earlier rice crop, and weeding and irrigating such as will be late. In many of the fields might be observed one-half of

the plants in seed, and being cut, while the other half, whose growth had been checked by the exclusion of light and air, become now exposed, and in their due season, arrive at maturity. The manner in which the field is laid down, and the short reaping hook in use, makes the separation of the plants very easy. The vegetables and fruits have been much the same as last month, with the addition of lettuce and large chillies.

September.—A great deal of rain has fallen during this month, keeping the paddy fields under water without artificial aid. On the morning of the 2d, there was experienced one of those severe hurricanes not uncommon within the tropics, but rare in this Northern latitude. A great deal of damage was done to the houses of the farmers and to the crops, the filling of which has been somewhat delayed. We now (25th,) see fields of rice yellow in the ear; this is the great body of the first crop. The second is green, and spreading well out, has been carefully weeded, and the soil thoroughly stirred up. Onions, lettuce and buck-wheat are already springing up on ground from which a crop of grain has been just removed.

Millet housed early this month, and the stalks are being now collected for manure.

30th.—Rice still being cut, thrashed and housed, and large patches of ground ploughed, set up in beds, and sown with wheat, mustard, and various kinds of vegetables. In the bazar, we have sweet potatoes, pears, chestnuts, walnuts, and limes.

12th October.—Upon the 1st and 2nd instant, we were visited by another hurricane, and the whole country was laid under water. The crops were thrown down, trees rooted up, houses unroofed, and many of them undermined. The weather, however, during the last 10 days, has been very fine, and on the water being drained off to its proper level, it was found that the crops were not so much damaged as

had been apprehended, nevertheless it must materially affect both the colour and weight of the grain. Old and young have been actively employed in reaping and thrashing, many of the fields are now undergoing ploughing in order to be sown with trefoil.. The process is simple, and combined. One manages a plough drawn by a single bullock, he is followed by three labourers with heavy four-pronged hoes, who raise the soil into ridges; a fourth follows levelling these ridges, and indenting them on the top with the back part of his hoe, and into these small holes, the seeds are laid, previously mixed up with mud from the bottom of canals. They are finally covered over with ashes and pulverized soil.

An inferior sort of cotton on the plains is being now gathered; on the loose dry soil on the sides of the hills are patches of a plant having a white flower: this is the polygonum, or buck-wheat.

31*st*.—Towards the conclusion of this month all is activity and change, one crop being ready for the sickle, while another on the same ground is seen springing into existence. The second rice crop has filled out well on the rich low lands and is now being cut, and thrashed out on the field. The plants are much more open in the light soils, and in the interstices of the uncut grain, trefoil has been already sown; a small hole is made with a rake, and the seed thrown in, and covered with a handful of ashes and pulverized soil; in this open, dry, and stimulating bed, germination is rapid; and the plant in its present state looks exactly like European clover. When it has attained some size, the earth is hoed up about it, and by this time its roots have become sufficiently strong to penetrate the hard clay: this it could have ill done in the first stage of its growth, hence perhaps one cause of the failure of clover seed in stiff clays. In other places, may be seen turnips and wheat planted alternately on the same piece of ground, the one arriving at maturity long before the other has attained any considerable height; some patches of

buck-wheat in full blossom, others passing into seed; in the spaces between the full-grown plants a young crop is now springing up. There are also large fields of a small species of French bean, much used in the preparation of bean curd. In the interspaces of these, trefoil is being sown. The land in this double cropping seems supported solely by assiduous irrigation with water and liquid manure, and the small allotment of vegetable ashes and pulverized earth already referred to, in which the seeds are sown. The young plants are also occasionally sprinkled over with the same preparation, and its stimulating effects are soon observable in the *deep green colour* of the leaf. Fine beds of radishes on the slopes of the hills, on ground lately cleared up of cucumbers and millet.

21st November.—During last week much of the low paddy ground has been drained, ploughed, and collected by the heavy 3-pronged hoe into beds, and laid down in mustard; the plants of wheat had been raised in forcing beds carefully prepared for that particular purpose. Of each little farm, about one-fourth is thus laid out in a crop of mustard; another fourth with trefoil, and the remaining two-fourths in wheat, barley and beans, leaving only a very few fields uncultivated, and these are either under water or ploughed over and exposed to the keen frosts of winter. Nearly the last sheaf of the second rice crop has been housed, and old and young are now busily employed in getting up the sweet potatoe crop, and cutting and tying up in bundles the species of bean already mentioned, and which after being dried in the sun is afterwards used to prepare bean curd, a very favorite article of diet among the natives. The soy bean is also much cultivated here. On such patches as had been under cotton cultivation, the plants have been pulled up, and the ground sown with trefoil. The cotton is of inferior quality here, and less attention appears to be bestowed upon it than in the other details of the farm. I think it probable, that the

foreign manufacture may eventually in a great measure supersede the home growth, as much on account of the greater cheapness of the foreign growth, as by reason of a steadily increasing population demanding an increased supply of grain.

During the first half of this month the weather was particularly mild, clear, and cool; but during the latter, there was much rain with fresh cold northerly winds, the thermometer being as low as 47°.

1*st December.*—The trefoil all sown, and much of it well advanced, being about four inches high, with a rich deep green-leaf, wheat and barley about the same size, looking fresh and filling well out. Ground for barley still being prepared and sown. These grains are not transplanted ; the ground is first well ploughed, then formed with the heavy hoe into beds about three feet wide, in which rows of small holes are made with a stone dibble, at a distance of about one foot apart each way : a few grains of corn are thrown in, and over this again, a handful of the ash and pulverized earth, without which no seeds seem to be raised. In this open and dry bed germination is both quick and favourable. On the long slopes of the hills much of the land from which sweet potatoes has been removed is being laid down in grain ; it is not ploughed but turned over with the hoe, and instead of planting the grain in a layer of ashes, it is more common to pour into the hole a small quantity of liquid manure ; the soil is yellow, deep, and open, and formed of disintegrated rock. About one-half of the sweet potatoes lately taken up, have been cut into thin longitudinal slices and exposed upon mats to the sun ; when perfectly dry they are packed in gunny bags, and preserved for use. In appearance they are quite white, and have a sweet and mealy taste. As potatoe is the best preventative of scurvy, might not these be found serviceable in long voyages, and even in the field when vegetables are not to be procured? Cabbages, turnips, radishes,

and a species of lettuce very plentiful. Observed in many places rotted straw, and placed on the surface of the soil between the rows of young plants, apparently with the intention of affording them heat, and preventing evaporation. Fine beds of onions, the tubers of which, however, are very small. It may be observed of all Chinese vegetables, and is indeed in some degree perhaps dependent upon the use of the liquid manure, that the leaf is most luxuriant, while the root, as in the carrot and turnip, is small, and has not the flavour of the European species.

18*th December.*—Crossed the island to-day from Tinghai to the opposite shore by a circuitous route, having rode about a distance of twenty-six miles through an alternation of beautiful cultivated vallies and bleak mountain passes. Many people employed on the sides of the hills cutting the long grasses for firewood, while others are busily engaged in plucking the leaves of the tallow tree (croton sebiferum.) The men ascend the trees by ladders, and with a sharp hook attached to a long bamboo, lop off the slender twigs from which the seeds spring. The women and children (and this is almost the only out-work I have seen these engaged in) pick them up, tie them in small bundles, and remove them in baskets to the farm-yard; they are then either sold to the tallow chandler, or sent to be expressed at the manufacturers. Still sowing barley, chiefly in the low lands, also transplanting mustard plants from the beds into the fields; hoeing and setting up the earth about the wheat and mustard, which are well sprung up; after each of these hoeings the liquid manure is applied, and in addition to this, many fields present a thick layer of dung spread in the spaces between the plants, and this again is covered with a layer of earth taken from the furrows on each side of the bed, which are not more than three feet wide.

31*st December.*—The weather during the last fortnight has been more mild than is common at this season of the

year; but the winds have been occasionally sharp, and the evidences of winter are every where very apparent, particularly in the bleak appearance of the hills, whose brown rank grass is being cut for fire-wood, conveyed to the farm-yard, and piled up in square stacks. Few labourers are now to be observed in the fields, and those are chiefly employed in hoeing about the mustard plants, laying cow's and pig's dung between the rows, and covering it with earth from the furrows, as already noticed. This both shelters the plant, and affords it sustenance; after each hoeing they are also watered with the liquid manure much diluted, and to such plants, whether of bean, barley, wheat, mustard or trefoil, as look backward or withered, an additional quantity of wood ash is applied to the leaves, and around the roots. There is still some ploughing in the wet clay soils, for the purpose of exposing them to the air, which the Chinese are well aware has a fertilizing effect. At home people cleaning and preparing the rice may be every where seen, while the other members of the families are repairing the tombs of their ancestors, thatching afresh the coffins of wood that are exposed in the open air, and burning with some ceremony the old thatch, cutting the grass over the graves, or building more or less expensive monuments of hewn stones to those who have lived long, and worthily, and died respected. Where the peasant has spent and ended his life of manly toil, there he is buried, and around each hamlet may be observed the monuments, some of them very humble, but all very chaste, which have been dedicated by grateful descendants to the successive cultivators of the same piece of land through many successive ages; hence springs one powerful cause of the cherished fondness of a Chinese to the place of his birth, and his unwillingness ever to forsake it.

15th January 1844.—A few people still engaged on the hills and among the graves in cutting the long grass and brushwood so much needed as fire-wood, and the ash of which we

have had so frequently to make mention of: others hoeing, and thinning the mustard plants, the young shoots of which are used as a vegetable. The wheat and barley have been kept carefully weeded by the hoe, represented in plate IV. fig. II., and this process presents something worthy of observation. I have remarked, that the soil, which has been for sometime in immediate contact with the plant, is removed, and replaced by that between the rows, thus affording a supply of earth undeprived of its fertilizing properties, and as it were diffusing equally over the field the degree of exhaustion occasioned by the rising crop.

The nights and mornings have been cold, but the sun powerful during the day, and the progress of vegetation is very marked, particularly in the rich leaf of the trefoil; many fields of this important crop which had been sown late in the season, and more particularly on unploughed ground, are just receiving a very fine sprinkling of ashes applied directly to the leaf. The turnips grown betwixt the rows of wheat and barley have been nearly all taken up for domestic use. Observed one or two fields manured from the farm-yard, and then ploughed over and exposed to the air.

30th January.—During the last fortnight the labours of the field have been much similar to those just detailed. The whole of the rising crop of mustard, grain, and vegetables has been well hoed, and between the rows of plants farm-yard manure laid down, and this again covered with earth taken from between the beds, to prevent evaporation. The liquid manure has also been applied in a very diluted form, and the appearance of the crops is now very promising. A second application of the wood ash has been made to the leaf of the trefoil, and in quantity varying with its late or advanced appearance. There cannot be a doubt but the ash acts as a stimulant, for although the several sowings are often at very distant intervals, still the farmer manages so well, that all arrive at maturity about the same time in spring.

The supply of fish during this month is most excellent. Soles, seer-fish, (equal to salmon,) rock cod, and mullet in great abundance. Oysters of good flavor, and other shell fish, as cockles, muscles, &c. Vegetables of the usual kinds; the best are the large Shan-tung cabbages imported from that province. Pheasants, hog, deer, wild duck, duck and teal, very cheap. The mutton in high condition, averaging about one mace (three annas) per catty. A few woodcock have been shot on the island, but snipe are again scarce, and do not become plentiful until spring. The weather has been keen and frosty within the last few days with snow, and the canals are now frozen over.

10*th February.*—Thinning mustard fields, the young plants being sold in the bazaar as a vegetable. The plants along the sides of the foot-paths have been sprinkled with a saturated solution of soot; this is done with the view of rendering them unfit for edible purposes, which makes them less liable to be stolen by passers-by or eaten by cattle. Observed a small patch of wheat which had also been thinned, and the thinnings transplanted. A few labourers to be seen hoeing, but more are engaged either in applying the liquid manure, or in forming dung heaps. Observed on the corner of a field fifteen deep square pits dug out in the thick clay, and in the course of being filled up with manure of almost every description; those I could distinguish were pigs, dogs, human fæces, cows, bones, and other offal. These were all worked up with water, layer after layer, by means of heavy rakes, into a homogenous mass, then packed well down, covered over by mats, and plastered with clay.

Groups of villagers are to be met with in almost every valley, assembled together by a common interest, and all partaking equally in the labour and expence of repairing the roads and bridges, and forming embankments. These are much required this year on account of the heavy damage occasioned by the late inundations and hurricanes. Many of

the people's houses have remained up to this time with the walls unbuilt, and with only a temporary thatch covering to protect their inmates from the hard vicissitudes of most severe weather; the care of their fields had demanded every moment of their time.

The preparations for the holidays are now commencing with great activity.

14*th February.*—The labours of the farmer, even those of the artizan and shop-keeper, are for a period suspended, and the attention of the people is carried away to other duties than those requiring the sweat of the brow, but no less called for by the customs of the country, than impressed upon them by the laws of nature. Great numbers now visit the temples for devotional purposes, while all present offerings at home. In every house, and in the meanest huts, may be observed a table well laid out with pork, fowl, fish, rice, salt, tea, sugar, oil, vegetables, and fruits, in fact with all that they consider the necessaries of life. These are the first fruits of the harvest, and with lights burning, gongs beating, and amidst the most humble prostrations of every member of the family, are they presented to the Giver of all gifts. The degree, order, and gravity with which this is done, does credit to their sense of decorum. Among the other relations of life enjoined upon the people at this time, is the payment of their debts; and so deeply is the character of individuals at stake in this matter, that every possible shift is made to discharge their obligations. They will even pawn their furniture and dress, or borrow money at heavy interest, rather than incur the censure of the public voice. This is also the favorite season for entering the bonds of Hymen, and the gay processions with their rude music that accompany the bride to the house of her accepted suitor, are none of the least interesting spectacles of the period.

I need scarce observe much of the visits of ceremony paid at this time; the feasts, and theatrical performances both

private and public; the more humble representations of Punch and Judy, rope-dancers, jugglers, and other like gentry, that are now let loose on the society by acknowledged privilege. Well have the people earned this brief relaxation from long continued toil, and young and old, rich and poor, all share in, and enjoy gaiety without care or reservation.

1st March.—Victoria, Hong-Kong. These notes have been rather abruptly terminated by my being ordered to Hong-Kong with Her Majesty's 55th regiment on the 17th ultimo.

There is little however of practical interest in the husbandry of this month, as far as I can recollect from observation during the spring of 1842 and 1843, so that upon the whole the diary will be found to furnish nearly as much as can be derived from observation alone, but comes far short, I doubt not, of what could be ascertained by any one well conversant with the language of the people.

The weather was cold and clear on the 1st February, with ice on the canals; for the following week it was mild, with slight rain on 5th and 6th, and vegetation made some progress on the 11th, 12th, 13th and 14th. The thermometer stood at 34°, 29° and 26°, accompanied with piercing cold N. West winds. The change from this, into the mild, and often hot and sultry weather which prevailed during the latter part of the month at Hong-Kong, made a strong and disagreeable impression on the feelings.

April, 1844.—Whilst lately travelling over the island of Hong-Kong, I observed several small patches of ground being prepared for rice; the process was similar to that already described, but I was sorry to see that women were employed in the fields, and in its most laborious duties wading knee-deep in the mud planting the rice seedlings, there is certainly some influence within the warm regions of the tropics that derogates from the manliness of the people. The story of the vain empress, who to improve her deformed feet resolved

to contract them, and to make this contraction a rule of beauty, at once occurred to me, and it now struck me for the first time, that the good lady had more likely affected a spurious taste to save her sex from slavery, and that by inculcating the confinement of their feet, she had adopted the only means of confining them to their proper duties, those of the domestic circle. The custom prevails universally in the North, and I have never there seen a woman at any laborious work in the fields.

Remarks.—The preceding notes place it beyond a doubt that the Chinese, even in this northern climate, and with a long bleak winter, during a greater part of which vegetation is suspended, can nevertheless procure from the soil one or two grain crops, besides two of vegetables. In the south three crops of grain are I believe not unusual. The ground is never fallow, still there is no evidence of its exhaustion after ages of continued cropping, and the rice that is raised presents as large and fine a grain as could be wished.

A knowledge of the practice which ensures such results, must indeed be interesting; its leading feature are these:—

1. A soil retentive of moisture.
2. A most abundant supply of water for irrigation.
3. The universal practice of drill, and dibble cultivation.
4. Repeated ploughing, hoeing, and stirring up the soil.
5. Attention to the weeding, and *ventilation* of the plants.
6. The green manure incorporated with the soil, whereby its due proportion of vegetable matter is kept up.
7. The wood-ash mixed with earth in which the seeds are sown, and the same ash applied to the leaf of the plant.
8. The direct and often daily application of the liquid manure according to the seeming necessities of the plant, and the soil.

Each of these might form the subject of a separate paper; I shall however dismiss them at present in a few words. The

bearing of all of them must be obvious, and their *modus operandi* is well explained in the excellent work of Liebig, of whose doctrines they are indeed a strong confirmation, a confirmation so extensive, practical, and yet unknown to him, that he may have cause to be proud of it; it is seldom that theory and practice, science and experience, do thus accurately tally.

Drill cultivation.

The universal practice of drill cultivation enables the labourer to keep the weeds under, and by his periodical visits to the fields he retains them clear at little labour, or cost. By this process also the seed is placed in the ground under favourable circumstances for germination, the ash and pulverized earth in which the seeds are sown, form a light open vegetable soil in direct contact with the germ, which it stimulates as well as nourishes. The ventilation of fields laid out in this manner is also perfect, not as may be daily observed in our heavy wheat fields, where the ground and roots never receive either light or air, although the wind is whistling over them. The stalks of grain planted by the dibble are generally strong, and resist the elements. By the same method two kinds of plants may be reared on the same piece of ground; the one, generally vegetables, arriving at maturity long before the other has attained any great height. This is often done as much to keep the farm people employed as to preserve a continued supply of young vegetables, which with rice and a very scanty allowance of fish, form the diet of the labouring classes. The Chinese seem also to have some notion that a change of crop is beneficial, and not so exhausting to the soil, but I am not well informed as to the principles that guide their cropping.

Hand-weeding

The system of hand-weeding is here in full operation, and the weeds are buried in the soil. The Chinese farmer knows well that when weeds are allowed to perfect their seed, the ground undergoes a comparative scourging, hence the trefoil and lupine are plough-

ed in as the flower begins to open, and the bean as the pod is forming. The soil is for the most part (and particularly in the plains) highly retentive of moisture, hence tanks are rare, and canals retain the water equally well, serve as a medium of transport, and winding among the fields afford greater facilities for irrigation.

Soil and canals.

These imperishable veins of wealth that cover the whole face of the land, are the noblest monuments of legislative wisdom, and of the nation's industry and enterprize; while the glory of successful wars, and extended empire, has passed away and is forgotten, the memory of those who planned, and executed these less dazzling, but more solid works, is cherished, indeed almost adored, by a grateful posterity. Famine has been almost banished from the empire, or its operations are become so partial, that the plenty of one district fully supplies the scarcity in another. Without such works how could China support a population whose great density has not been exaggerated, and where early marriage is enjoined, a numerous family, viewed as the highest gift of heaven, and where polygamy is sanctioned to all, and generally prevails among the middle classes; these are symptoms of a healthy state of the empire, and present a strong contrast with modern Europe in its most palmy days, where prudence and necessity so often enjoin a cheerless celibacy.

2d. The care of the Yellow river, to restrain it within due bounds, and to regulate the sluices, is one of the most important trusts under Government. All other great rivers, and the grand canal are equally looked to by the State, but smaller streams and canals are regulated by the individuals whose grounds benefit by them. At Chusan, for instance, where the small streams are apt to be dried up during occasional draughts, their waters are prevented from wasting themselves in the sea by means of dams and sluices at their mouths; the canals are thus always kept filled; however low

the stream, none of it is lost, and it is only on the occasion of a very unusually prolonged dry season, as occurred in 1843, that the rice crops become endangered.

The grand canal and all others fed from the Yellow river, Yangtzekiang, the Min, and other great streams, can never be deficient in a supply of water, as their sources are never dried up.

A glance at a good map will show how admirably this country is watered by nature and by art; its great rivers running from west to east traverse the whole breadth of the country, water every province, and render the agriculturist almost independent of local rains. Intersecting these again, and fed by them, is the grand canal running nearly north and south, connecting both extremities of the empire, watering the intermediate country by innumerable channels that branch off from it, and affording a safe means of transport for a people who are unskilled in navigation, and whose ships are exceedingly rude, and can only make coasting voyages while the monsoon is favorable.

Would that some such great work as this canal could be accomplished in India. What consolidation of our empire, what increase of revenue, of population, and of human happiness! Those fearful famines that carry off their tens of thousands, sweeping away whole communities, their stocks and their habitations, and rendering a once fertile region a very desert. The miseries of such awful visitations, the lingering deaths, the ruin of families, the loss to the revenue, and the danger to the public health, exceed that of the most destructive wars; witness only the recent famine in the Guntoor district, where 150 thousand men, women and children with all their cattle perished of hunger and thirst.

China is nearly exempted from such calamities.

The noblemen and gentlemen of England have formed rich and powerful societies for the promotion of agricultural improvement, the best means of enriching the soil, of improv-

ing the quality of the grain and the breed of stock, and by mechanical invention to diminish the expence of agricultural labour; these are undoubtedly high motives, and have done great good. China is behind in all such institutions, but her paternal Government are opposed to any measures for diminishing agricultural labour, the instruments of which are intended rather to direct than to abridge it, and on the principle that it is the duty of the Government to find employment and food for her industrious classes, she has given the labourer a deep interest in the soil by fixity of tenure. She inculcates, and indeed enforces (with that unity of decision which is the best feature of her despotizing,) industry and prudence, and points out to the farmer that if he repose in these virtues he will best secure his own independence, and that degree of comfort which makes life worth possessing. I have never seen in this country that painful, and often mournful sight,—a flitting,—that parting from a hearth consecrated by old and kindly associations, and deep in the prejudices of a half civilized people. Powerful ought to be the necessity or expediency that can justify such a step, and hard must be the heart that can contemn these sacred feelings, or look on them with indifference.

The produce of Great Britain and Ireland, might, I think, be doubled, by following the Chinese system; but the example must be shown by the landed proprietor under whom the most prudent and intelligent of the people ought to be employed to show example to their countrymen; perhaps the system of model farms might best carry out these views. There would be necessarily,—

1st. A judicious system of small allotments under the eye of a responsible head.

2d. The prudent and intelligent among the poor to hold these at a small quit rent, conditional on their adopting the drill cultivation.

3d. The practice of irrigation ought to be encouraged, and stall feeding in preference to pasture, as they obtain in China.

4th. The careful storing up of the night soil and urine of cities and towns, which form the bulk of Chinese manure, but in England run almost wholly to waste.

5th. All wood-ash to be preserved, moors to be cut, and burned for the same purpose, and peat moss would in the Highlands of Scotland form an inexhaustible source for a supply of carbon, it might become indeed an important article of export. Abundance of water, of carbon, and of the salts contained in urine, are, among the Chinese, the leading nutriments of vegetables. The soil is not really richer than other favored spots of the globe, but it is made artificially so by a great amount of labour, and by the careful storing up of the waste in the animal and vegetable kingdom (little attended to by other nations), and by never stinting the plant in its supply of water, of light, or of air.

A Chinese farm is indeed a perfect picture of order and neatness, its like is no where else to be seen on a small scale. The question of how this arises, involves the history of ages, for nations like men are very often the children of circumstances. In the neighbouring Spanish (the Philippines) and Dutch settlements, with a climate and soil superior to any parts of China, but one crop of rice is obtained, and few if any vegetables are cultivated.

In July and August last I had an opportunity of examining some of these islands, the paddy fields bore every evidence of neglect, and rank grass which had nearly perfected its seeds covered their surface. On questioning an intelligent Chinese emigrant as to the cause of the difference between the condition of fields here, and in his native country, he replied "that by one crop the people made sufficient to supply their wants, and that they were too lazy to work for more." The destitute state of the poorer classes in Great

Britain and Ireland, would imply that a strong necessity exists for additional zeal in the prosecution of agricultural improvement, with greater encouragement to the practice of husbandry. In small allotments at home we too frequently observe the soil exhausted, and the rising crop being buried by luxuriant weeds, or sinking after drought, although a river lie but a few yards distant. The agricultural class is the most robust and most patriotic of a nation, they owe this perhaps to their position, but they ought to be fostered, let us hope they are not being allowed to degenerate. It has been observed by one of the best of men, and it accords with the experience of every age and every people, that a population is always more orderly and virtuous when scattered over a district than when congregated in masses. It is also less liable to be agitated by political speculators, when afforded the means of constant employment and moderate subsistence, than if subject to the fluctuating condition of the manufacturing market so contingent on our foreign relations, and the progress of mechanical science in other states.

Explanation of the Plates.

Plate I.

Fig. 1.—Reaping hook. The edge is smooth, and finely tempered. It is used for a variety of purposes, as to cut brushwood and vegetables.

Fig. 2.—The plough. The frame-work is wood, it comes to pieces, and the whole is so light, that at even-time the labourer carries it home over his shoulders. The *share* is made of cast iron: it has no coulter.

Plate II.

The common harrow. The row of large perpendicular teeth are made of iron. The driver stands on the cross bar of the frame *a*, resting his arms and breast on the bar *b*. The yoke which is made of wood, is seen at *c*.

This harrow I have only seen used in paddy fields, which are always ploughed and harrowed, partially inundated. In dry soils the Chinese

do not use a harrow to break up the clods, they find the heavy hoe do this much more effectually.

Plate III.

Represents the heavy harrow for cutting up the green manure, and incorporating it with the soil. *a. a.* and *b. b.* the strong frame-work. *c. c.* the rows of horizontal concave knives.

Plate IV.

Fig. 1.—A light shovel for scooping up the earth between the beds, and placing it between the rows of plants.

Fig. 2.—The hoe most commonly used in weeding.

Fig. 3.—The wooden rake for stirring up the water and mud between the rows of rice plants.

Fig. 4.—The heavy four-pronged rake in general use for breaking up all stiff soils, after ploughing; this rake is used to form the field into rigs or beds, in which the seedlings, whether of grain or vegetables, are planted.

Plate V.

Represents the method of carrying heavy burthens of every description. The pails *a. a.* are those used for conveying the liquid manure to the field; they are often furnished with covers.

Plate VI.

Fig. 1.—One of the pair of baskets used to convey farm-yard manure or earth to the fields. It is made of twigs of bamboo.

Fig. 2.—The shield worn over the face for protection while the labourer is on his knees weeding the rice fields.

Fig. 3.—The wooden chain pump. This is the only means of raising water used on the Island of Chusan. For the modifications of this machine, and for an account of others in use among the Chinese, vide Mr. Davies's Work.

Plate VII.

Fig. 1.—A bamboo rake for dressing corn, and turning it over to dry.

Fig. 2.—A heavy hoe for breaking very stiff clay soil, it very much resembles our mattock.

Fig. 3.—A rice mill, *a.* is the hopper, *b.* the stone roller which traverses in the stone gutter *c.* The opening at *d.* is the outlet for the cleaned rice. *e.* is the yoke, it is drawn by a bullock.

Plate VIII.

Represents another kind of grain mill, which is most commonly used to grind millet. *a.* is a stone roller which traverses in the gutter *b.* This machine is worked by a small bullock.

Plate IX.

A mill for making bean curd, also used at times to grind rice: it consists of two granite stones, the lower one, fixed to a heavy stool, has a groove round its upper margin, in the upper stone there is a hole at the top by which it is fed, close to this the handle is attached, it is worked by hand.

On the Black-Dye Plant of the Shans· and on the Gutta Percha, or Gutta Tuban. By W. Griffith, *Esq. F.L.S.*

The specimens of the plant, said to yield the above product, which were communicated to the Society by Mr. Landers, belong to the genus Diospyros of the natural family, Ebenaceæ.

This family, which forms not an unimportant part of the Indian Flora, is remarkable for the hardness and blackness of the wood,* of which Ebony and Iron-wood are notable instances. It also appears to be remarkable for an astringent principle,† (dependent in one species at least on the presence of tannin,)‡ to which the extreme acerbity of the fruit of some before maturity is probably attributable.

A few yield an edible fruit;§ one is imported dried from China, and one is sold in the Calcutta market under the name of Mangosteen, to which exquisite fruit it does not bear any resemblance in appearance or taste.

The fruit of the Gab, a well-known and valuable Indian tree, (D. Embryopteris,) yields a viscid juice used extensively

* Lindl. Introd. Nat. Ord. p. 227. Endl. Gen. Pl. p. 742. Royle. Ill. p. 261-2.

† Voigt, Hort. Suburb. Calc. p 344-5. No. 9. 14. Royle Ill. p. 262.

‡ Voigt, Hort. Suburb. Calc. p. 345. No. 14.

§ Lindl. Intr. l. c. Endl. Gen. Pl. l. c. Voigt, Hort. Suburb. Calc. p. 344-5. Nos. 8. 9. 14. 16. Royle Ill. p. 262.

for paying the bottoms of boats, and in Malabar, according to Rheede, for book-binding, both on account of its adhesiveness and being obnoxious to worms.* An infusion is employed to steep fishing-nets in, to render them more durable.†

I have not been able to find any notice of a dye produced by this family, but the character of astringency, which as I have said in one, at least, depends on the presence of tannin, will explain the capability of producing a black dye. At the same time it throws a doubt upon the statement, that the dye is an independent one ; a doubt certainly indicated by the analysis of the manufactured dye-stuff by Dr. Mouat.‡ In connection with this, however, the analysis of the black wood, so black in Ebony as to be proverbial, may deserve some notice.

In a communication from Captain Warwick to Captain Macleod, Principal Assistant to the Commissioner, dated Nov. 12, 1843, received from Dr. McClelland, it is stated, that the black dye is called *Mocloe or Maclue,* which is also the name of the tree that produces it. This grows to a large size ; the heart-wood is jet black.

The berries, which are employed to produce the dye, are put into a mortar and broken, then well mixed with water : the solution has the appearance of dirty milk. It is now fit for use, and articles, such as silk, cotton, &c. are dyed by dipping repeatedly until they become jet black.

For making the cakes, in which state it was communicated to the Society, the water of the solution is strained off, the residuum pressed into the required shape, and laid out to dry, when it becomes black and very hard. It does not require to be put through a process like that employed in producing Indigo.

The following is a character and description of the plant.

* Voigt, Hort. Suburb. Calc. p. 345. No. 14.

† Voigt, Hort. Suburb. Calc. p. 445. No. 14.

‡ Journ. Agr. Hortic. Soc. 2, p. 206.

D. *mollis*, (n. sp.) ramulis pubescentibus, foliis ovatis utrinque acutiusculis vel ovalibus, pagina utraque pube brevi molli tecta, calyce (fl. fæm.) 4-sepalo, fructibus solitariis axillaribus breve pedicellatis globosis 8-locularibus coronatis stylis 4 truncatis pubescentibus.

Hab.—Min-out and Zemmie, Shan Country. Captain Warwick and Mr. Landers.

Descr.*—A large tree, (*Capt. Warwick.*) A shrub or small tree. (*Mr. Landers.*) *Branches* about a span long, obtusely angular, with the leaves, peduncles and calyces (exteriorly) pubescent. *Petioles* 3 lines long. *Lamina* of the leaf ovate or ovato-lanceolate, of the lower ones sometimes elliptic or nearly round, shortly and obtusely cuspidate, slightly undulated, quite entire, soft to the touch from the pubescence of both surfaces; secondary veins slightly prominent on both sides, spaces between equally reticulated.

Young fruit axillary, on short stout stalks, ascending or spreading, secund, ovate, surrounded at the base by the half-deflexed 4-lobed calyx, (the lobes thick, coriaceous, rounded, concave underneath, sometimes almost conduplicate,) the base a good deal thickened and articulated with the pedicel; the apex surmounted by four, short, erect, truncate, pubescent *styles*. *Cells* 8, each containing an immature pendulous seed.

Ripe fruit globose, of about the size of a largish cherry, somewhat depressed and umbilicate at the apex, smooth, surrounded at the base by the persistent calyx; *epicarp* thin, papery; *pulp* rather abundant, spongy-farinaceous, interspersed towards the cells with longitudinal fibres; *endocarp* membranous, very fine, closely surrounding the seeds. *Seeds* solitary, (some abortive,) pendulous; shape variable,† concavo-convex, or bifacial interiorly convex exteriorly; *tegument* brown, shining, membranous, easily separating. *Albumen* copious, cartilaginous, with a few veiny impressions on the surface. *Embryo* with a long, superior clavate radicle and lanceolate obtuse *cotyledons* about the length of the *radicle*, plicate and subcordate at the base.

* From specimens of the branchlets in fruit preserved in salt and water.

† This depends on the number matured, and consequently on the degree of approximation.

It belongs to the third subdivision of the third section Eudiospyros, De Cand. Prodr. 8. p. 224, and appears to approach D. montana* and sylvatica.†

EXPLANATION OF THE PLATE.

1. Branch, natural size.
2. Young fruit, cut across.
3. Ripe fruit.
4. Seeds.
5. Another, one of the flat faces.
6. Long section of albumen.
7. Embryo.

Figs. 5, 6, 7, more or less magnified.

On the Gutta Percha, or Gutta Tuban.

This substance of which an analysis was given by Dr. Mouat,‡ was stated by me,§ from examination of a small branch without flowers or fruit, communicated by the Rev. Mr. White, Chaplain of Singapore, to be produced by a plant of the Natural Family Sapoteæ, and to have the characters of the genus Chrysophyllum.

The leaves are alternate, rather distant, narrow lanceolate, attenuate at the base, caudato-cuspidate at the apex; the under surface of a golden brown colour with indistinct distant straight secondary veins.

To extend our information regarding this article, I have the pleasure of submitting an analysis of the Gutta Percha, and of the gum of the Sapota tree, (Achras Sapota,) procured from specimens in the Honorable Company's Botanic Gardens. These analyses, which were made by Mr. Scott of the Honorable Company's Dispensary, were communicated by Dr. M'Clelland.

* Roxb. Icon. 9, t. 49. † Roxb. Icon. 9, t. 48.

‡ Journ. Agr. and Hort. Soc. 2. p. 101.

§ Calc. Journ. Nat. Hist. 5, p. 116, where by inadvertence the fruit is stated to be edible, instead of to produce a concrete edible oil.

"The Gutta Percha forwarded to the Medical Board, by Dr. Montgomerie from Singapore, is one of those neutral vegetable substances, of which a proximate analysis cannot be made. On a careful examination, I have found it to possess the following properties :—

"It is insoluble in water and in alcohol; soluble in volatile oils, and partially so in ether, from a solution of which it is precipitated by alcohol.

"It melts when exposed to a temperature of 248°, and on cooling, remains in a semifluid adhesive state. When heated sufficiently in the open air it catches fire, burning with a strong yellow flame, and emitting much smoke.

"On distillation it furnishes a volatile oil, similar in all its properties to Caoutchouc.

"It is insoluble in petroleum and in nitric ether.

The Gutta Percha is in thin films, varying in colour from a pale yellow to a pinkish tinge, and is destitute both of taste and smell. It is hard at a common temperature, but when immersed in boiling water, it softens so much, as to be capable of being beaten into a mass, and formed into any shape required; this, however, must be done immediately, for the mass on cooling becomes hard and unyielding.

"When in a soft state, it can be stretched out into thin slips much beyond its usual length, but it does not recover its former bulk when the force is withdrawn. The slips are transparent and elastic.

"I feel no hesitation in pronouncing the Gutta Percha a species of Caoutchouc, possessing unquestionably some of its principal properties, but it is a species which I believe has not been examined before."—*J. G. Scott.*

"The juice of the Achras Sapota, was received in a concrete state, the greater portion in rounded pieces, or tears of various sizes.

"It is slightly adhesive to the touch. When dried at a common temperature, it gradually hardens, entirely losing its

adhesiveness, and is easily broken. It is soluble in essential oils, the solution having a milky appearance; insoluble in absolute alcohol and cold water; immersed in boiling water it softens and becomes extremely glutinous. It burns in the open air with a bright smoky flame, and when heated, it fuses and remains more or less viscid. It is entirely soluble in washed ether, from a solution of which it is precipitated by alcohol.

"The juice of the Sapota tree, (as well as the concrete juices of several plants containing Caoutchouc which I have analyzed lately,) differs from the Gutta Percha in its most important property. The action of boiling water on all those I have examined, softens the mass, but it renders it at the same time so extremely adhesive, as to obviate the possibility of rolling it out, or forming it into any shape whatever. The mass remains in this viscid state for sometime, when it hardens and becomes friable. The Gutta Percha, on the contrary, acquires no adhesiveness by the action of boiling water, and immediately on exposure to a cooler temperature, it regains its original toughness and flexibility."—*J. G. Scott.*

The valuable properties of Sapoteæ are many: it is known for producing much esteemed fruits,* good timber, useful gum, for affording a vegetable oil or butter, an ardent spirit and febrifuge medicine; the flowers in addition are used as an article of food.

But the main characteristic, and that with which we have most concern, is its milky juice. And although thus far the Gutta Percha tree agrees with the general character, yet its juice differs very remarkably by the absence of adhesiveness, to which peculiarity indeed it owes its value. This promises to be considerable; for a vegetable product which

* Lindl. Intr. Nat. Ord. p. 226. Royle Illust. p. 263. Voigt, Hort. Suburb. Calc., p. 340.

is softened by hot-water, while at the same time, it is capable of being moulded into any shape, that afterwards hardens, (in which state it is not acted on by a hot or moist climate,) so as to be preferred to horn for the handles of axes, is capable of extensive application.

Report of Proceedings regarding the inspection of Lands best suited for the cultivation of Cotton in the District of Dacca. By J. O. PRICE, *Esq.*

(Communicated by the Government of Bengal.)

To the Honorary Secretary to the Agricultural and Horticultural Society.

SIR,—In continuation of my letter, No. 610, dated the 18th July last, I am directed to forward, for the Society's use, a copy of Mr. Price's reports up to the month of August last.

I am, &c.

C. BEADON,

Under-Secretary to the Govt. of Bengal.

Fort William, 16th October, 1844.

To F. J. HALLIDAY, *Esq. Secretary to the Bengal Government, General Department.*

SIR,—I have the honor to submit to you, for the information of the Honorable W. W. Bird, Governor-General of India, the monthly report of my proceedings for the month of June.

2nd. In the early part of this month, I received three packages of acclimated New Orleans cotton seed, immediately after which I proceeded to the district of Dumroy, at which place I had sometime ago promised some ryotts a small quantity of the American seed as soon as it arrived here, and also to point out to them the manner in which they should cultivate it, which promise I went there for the

purpose of fulfilling; from thence I returned to Dacca, after being detained for some days by high winds on the river Bunsee.

3d. Some days after my return to Dacca, I had the honor of receiving your official letter of the 6th instant, after replying to which I again left this place and proceeded to Sonergong, to which place I went for the same purpose that I had gone to Dumroy, also to examine some young cotton that a ryott had planted there early in the month of May; but having mixed it with a crop called teel, I am afraid it will not do much, although the seed vegetated well; this is their usual mode of farming, and I find the ryotts are very hard to persuade that they would gain more by planting their cotton crop separate from their other crops, which I am quite convinced they would do.

4th. I have much pleasure in informing you, that I do not anticipate that there will be any trouble in renting lands on the river Banar for the Government experimental cotton farm, and at a cheap rate. This is the only way land can be got in this district, as the lands in every part of it I have been, are in the hands of Zemindars, and those to whom the lands belong in the districts of Toke and Cappasia, are particularly favourable to the Government experiment, in which I have the honour of being employed.

I remain, &c.

Dacca, 30th June, 1844. (Signed) J. O. PRICE.

SIR,—I have the honor to submit to you for the information of the Honorable the Deputy Governor of Bengal, the monthly report of my proceedings for the month of July.

2nd. Early in this month, I proceeded up the river Banar, for the purpose of inspecting the interior of the country on either side of that stream; namely, that of Cappasia on the right side of the river, and that of Toke district on the left. This further examination of that district of country strength-

ens much, my former opinion, that it is the most favorable locality in this district for cotton cultivation, and particularly adapted for an experimental farm for several reasons; in the first place any quantity of land required can be got with very little trouble, and the variety of kinds of soil that can be obtained in the extent of a moderate-sized farm in that district, will afford an ample opportunity of planting at different seasons of the year, so as to judge safely not only of the soil in this district best suited for the growth of the cotton plant, but also of the season of the year best suited for the cultivation of the cotton plant.

3d. During the remainder of this month, I have been busily engaged examining the interior of Bowal Purgunnah, which the present high inundation has enabled me to do by water; this I was prevented from doing on my arrival in this district, the rivers having fallen considerably before I reached Dacca in October last; but I have not seen any place so well suited for the Government experiment in cotton cultivation as the districts of Toke and Capassia.

4th. In the early part of this month, I sent a box of acclimated New Orleans cotton seed to Tipperah to have it planted on the hills. The natives there grow a considerable quantity of a coarse kind of *Cupas*, but I am in hopes, that a change of seed, as also that of cultivation, will improve the staple of the cotton of that district. I have also given seed to a number of persons who are anxious to try exotic cotton seed on their lands, and as their attention will not be taken up for a length of time with their indigo cultivation, I am in hopes they will give it a fair trial.

5th. I hope soon to have the honor of being authorized by Government to commence establishing the Government experimental cotton farm in this district, as it will take some time to erect huts for coolies, &c., and also to prepare the land for receiving the seed. I am, &c.

(Signed) J. O. Price.

Dacca, 1st August, 1844.

To J. DUNBAR, *Esq. Commissioner of the Dacca Division.*

SIR,—I have the honor to submit to you for the information of the Honorable the Deputy Governor of Bengal, the monthly report of my proceedings for the month of August.

2nd. On the 4th instant, I visited the neighbourhood of Foolbariah on the Dullasary, for the purpose of examining a patch of cotton I have at that place, and which I mentioned in my report for the month of May had suffered very much from the gale on the 22d and 23d of that month, but with additional care has quite recovered again, now bearing bowls for the second time. From thence I went to a village named Karnoparah, at which place a ryott has some cotton seed planted that I gave him, and from his having taken more care of it than any native that I have yet given seed to, I found it looking very healthy; I next went to the district of Dumroy, but the person to whom I had given cotton seed there I found had left that neighbourhood; from that place I returned to Dacca, where I remained until J. Dunbar, Esq. Commissioner of the Dacca Division left for Sylhet, having been requested by him to remain in the vicinity of Dacca for a short time.

3d. On the 26th instant, I again visited Foolbariah, and I am happy in stating, that I found the plant grown from New Orleans seed bearing well, and some of the bowls already open, a few bowls of which I pulled and send to you; it has got a little bleached by being allowed to remain on the tree too long, and having got wet from rain, but the size of the bowl is good, one of which I send you to judge of, and the fibre of which is good and strong; but what I planted of the Bourbon seed is running too much to wood, and I am afraid will require to be checked by pruning, being at present seven feet high without having yet blossomed.

4th. I have much pleasure also in informing you, that some cotton seed I sent to Betal, which is situated on the Burumpooter river, is likely to turn out well; it is now about four feet high and in full blossom.

5th. Hoping that the farming implements, seed, &c. &c. may arrive in good time this season for October planting,

I have the honor of remaining, &c.

(Signed) J. O. PRICE.

Dacca, 1st September, 1844.

The Sugar Planter's Companion.

BY L. WRAY.

(Continued from page 118.)

On Molasses, &c. &c.

The quality and value of the molasses which drains from the curing vessels, very necessarily depends on the description of sugar from which it is separated, and the methods used in effecting that separation. If the sugar is boiled at once from cane juice, and allowed to drain off its molasses without any auxiliary aid, it is then what may be correctly called, true molasses, and is decidedly the very best description for the purposes of distillation; but when sèwah, clay, or other moist substances have been applied to disengage it, a great portion of the already crystallized particles becomes dissolved, and also drains off. This may then be termed molasses syrup, as containing a large quantity of the crystalline syrup, and each repetition of the process increases the richness of syrup, whilst the molasses in combination is very small indeed. The quality of the molasses is altogether dependent on the state of the cane juice, from which the sugar is boiled, and in re-boiling the molasses, this is very particularly noticed. To re-boil molasses is very uncommon in the West Indies, as the high price of their rum,

and the slight trouble distillation gives, perhaps more than counterbalances the greatest good to be expected from this second concentration. Circumstances may alter this in India, for instance, the greater cheapness of labour and fuel here, and the low price of East India spirit, in comparison with that of the West Indies. In Jamaica, the young planter who could not make a gallon of strong rum for every gallon of molasses supplied him, was considered unfit to have charge of a "still-house;" whilst with rich molasses and plenty of refuse from the boiling-house, from $1\frac{1}{4}$ gallon to $1\frac{1}{2}$ gallon of rum, was very frequently the proportion. This handsome return, with the high rates obtainable for this favorite rum in the markets, rendered it next to folly to attempt the expensive process of re-concentration with its very doubtful results. In India, the general *argument* is very different, and the legal difficulties under which a distillery labours, and which I shall notice in its proper place, are strongly urged as an objection.

Here then, the practice of re-boiling the molasses, is general, although I will not say it is advisable; as far as I have witnessed, sufficient care is not taken to secure it against fermentation, which commences very early, and by which a very great portion of its crystallizable matter is destroyed, the whole body much decomposed, and consequently deteriorated, whether intended for re-boiling or distillation. To prevent this fermentation is very easy, for whether the curing vessels used, are cases, cones, nauds or casks, the receptacles placed beneath them could have a slight muting with sulphur or vapour of sulphur, so as to preserve the molasses until they were removed to the boilers, or discharged into the large molasses receiver, where a further application could be had recourse to, if found necessary.

By this method, molasses could be shipped from the Upper Provinces to Calcutta, and from thence to Europe, without undergoing any prejudicial change.

That molasses which drains from sugar, unassisted by and unmixed with water, such as proceeds from clay, sèwah and other applications used in curing, will keep a long time without fermenting, in comparison with that, so mixed, and therefore it is, that from sugar treated with sèwah, molasses drains, which is often in a high state of fermentation long before it reaches even the molasses receiver. I have seen it in the receiver frothing up, a foot or more, and this continuing for days, whereas, nothing can be more easy than to arrest the process, or even to prevent it in the first instance; but it is astonishing how indifferent and careless people are, even to their own interest, when the appliance, however simple, is a little out of their common jog-trot practice.

"Oh! it's such trouble and bother, besides we can't lose very much," is an answer I once had, returned me; and although not always expressed, it is by far too general a feeling. Every planter should bear in mind, that he has active, careful and economical competitors to struggle with, and that it behoves *him* to be cautious, prudent, and strictly economical; that every slight saving is a decided gain, and every well advised precaution, a safeguard and security.

That which is often designated a trifling waste, generally proves in the end a serious loss, and the case above-mentioned forms no exception. One complains "I have boiled my molasses, but have got a very poor return indeed, of dark coloured '*doomah.*'"* Another, "It's no use trying to make rum here, I have used all my molasses and have obtained a *spirit*, but no more like rum than chalk is like cheese." Yet they do not for a moment consider, that they have themselves greatly to blame for such failures, as had they used common prudence, and the smallest exertion, their molasses would have escaped the injury effected on it by fermentation.

In a curing house, I consider this care of the molasses, to be of much importance, especially, as I said before, in

* Inferior sugar obtained from molasses re-boiled.

India, where the molasses is bad and mixed with water, and other matters of an injurious tendency; I have therefore given it a prominent notice, and would press it on the attention of my brother planters.

For reboiling molasses, the wide, shallow, sheet-iron pans used by the natives, answer the purpose very well, and are cheap, light, and boil quickly. I found that the following mode of treatment produced better returns, and fairer sugar, than any other that I tried:—

The molasses (presumed to be good) I first diluted very considerably with water, in which a small quantity of alum had been dissolved, then put it into the first pan or clarifier, and applied a gentle heat. As it became warm, I gradually introduced a lye made from stone lime, milk, and water, until, as the heat increased to a gentle simmer, a number of small flakes were seen in the liquor, which shortly became general throughout, and of a larger size. I then emptied the contents of the clarifier very gently into strainers placed one above the other, until the lowermost or finest (cloth),* delivered it into the concentrating pan; where, if *necessary*, a little more plain lime water was added from time to time until the process was completed, and the skip struck. It was then received into a large gumlah and kept moved about until symptoms of granulation appeared, when it was transferred to small shallow nauds, and left to itself until quite cold and granulated throughout, the plugs were then removed, and drainage allowed for the space of six or eight days, after which light claying, two or three times repeated, brought it to its most perfect state.

Claying cannot be had recourse to with prudence under the time stated, as the grains take long to form in sufficient strength to resist the action of moisture; nor must the clay be too wet, or great loss ensues to the very weak crystals; as is well known to every native refiner. This inferior sugar or "*doomah*", is not by any means a productive article

* This filtration takes some considerable time to compelete.

for refining, and had always better be mixed with other strong-grained sugars, and if possible, boiled in vacuô. It is a common practice with native sugar manufacturers up-country, to mix their whitened *doomah* with their first quality sugars, and thus very much deteriorate their value.

From this arises the anxiety of sugar dealers to purchase their fine sugars as early in the season as possible before the manufacturers have time to reboil their molasses and effect the mixture. On a sugar estate in India, reboiling molasses may be carried on in a tiled shed adjoining the boiling or curing house, and the shallow pans can very well be hung over furnaces constructed with well-made kutcha bricks (sun-dried,) cemented with good (clay) mud. After this simple, but very general, furnace is perfectly dry, the fire applied to the pans burns the bricks and mud-mortar perfectly hard, and renders the whole strong and lasting. The fuel and attendance together with the larger curing house required, would form the chief items of expence, and it remains to prove by practical demonstration, whether reboiling one's molasses is more remunerating than converting it into rum. This I shall now proceed to argue from known results and my own experience, premising always, that the description under consideration, is that which I before particularized as *pure molasses*, or the first drainings from sugar boiled direct from cane juice, &c. &c. I will take an estate in India, making say 500 tons of sugar, or Calcutta maunds 13,500, and giving 8,500 maunds of molasses, which being reboiled, yields at 15 per cent. 1,375 maunds of inferior sugar or *doomah*, and 6,670 maunds inferior molasses, allowing for waste. The account would then be as follows :—

1375 Calcutta maunds of inferior sugar or *doomah*, @ 5 Rs.	Rs.	6875
6670 Ditto ditto of inferior molasses, @ 8 Ans. ...		3335
	Total, Rs.	10,210

This, I consider as fair an allowance, both in quantity and price for both, as can reasonably be hoped for, but from this sum we must consider that the manufacturing charges have to be deducted, whilst cost of extra erection may be placed to block of concern. Against this, let us take the above-mentioned 8,500 Calcutta maunds of molasses to the distil house, where with the scummings from boiling-house and other refuse, a return of superior flavored rum may be expected, at the rate of *five imperial gallons 20 per cent. over proof* to every maund of molasses, or a total of 42,500 imperial gallons 20 per cent. over proof, valued at 8 Ans. Rs. 21,250. Having the advantage of the boiling-house stuff, and the molasses being pure and fresh, this rum would naturally be far superior to the common East Indian rum at present made, and the price mentioned is therefore exceedingly low,* whereas the average return of 5 gallons per maund, is grounded not only on my own ideas, but justified by the results during the last four years of a distillery in this country, conducted by a West India planter of 25 years' experience.

I know that the expence of establishing a distillery and the heavy deposit to Government, is what militates so much against it in India; but when I enter on the subject of distillation, I shall treat more at large on the merits of the case. The next kind of molasses, is that, I have before called molasses syrup, as resulting from sugars treated with sewah, clay, &c. &c., and which although much mixed with water from these, yet abounds much more with crystallizable syrup than with molasses, and is consequently richer and more easily concentrated. It is not advisable to mix this quality with the foregoing, but rather with the syrup obtained by the subsequent applications of clay, &c., and boil down into fine sugar, which with a little care it will always yield. The sugar from which these repeated drainings are supposed to come, I class as fine clayed sugars fit for the home market; and of course the more perfect the canes are, the

* It might be estimated, with great safety at 1 rupee per gallon.

more rich will be the juice, and the less trouble will it give in curing. One magma of clay will answer with some qualities, whilst others may require two or three repetitions, and the syrup drainings will of course be in proportion.

Many persons prefer shipping their molasses to England, and according to quality the prices range, for Jamaica, from 17 shillings to 28 shillings per cwt.; for Bengal, from 12 shillings to 18 shillings per cwt. Now with good molasses at 18 shillings per cwt., it is almost a query whether it is not just as well to ship as to reboil or distil, unless a larger proportion of *doomah* can be obtained, or the price of good East Indian rum attain to something like 3 shillings or 3*s.* 6*d.* per gallon, 20 over proof. The molasses shipped from India is usually of a very inferior quality to that of the West Indies, as the difference of price evidences; but were care to be taken by planters manufacturing their own produce, I see no reason why that difference should not cease to exist, and their shipments realize highly remunerative rates. As I before remarked, molasses may be preserved from fermenting, by burning a few sulphur matches in the destined receptacle, and on transferring it to casks for shipment, a further muting may be advisable, which would assuredly preserve it from all risk of fermentation taking place during the passage home. To planters of small means, and new beginners, this method of disposing of their molasses offers many temptations, and in my opinion is more to be relied on than the present system of reboiling.

In the West India Islands, this reboiling has recently engaged the very serious attention of their Agricultural Societies, but I think I shall be able to shew as I proceed, that their present distressing situation, rather than the real merits of the suggestion, has induced them to entertain it; they are truly in the position of drowning men, and in their desperate efforts to maintain themselves, catch at straws and fantasies. Amongst the many useful suggestions which they undoubtedly have al-

ready supplied, (and will yet continue to bring forth, as their severe necessities sharpen their inventive faculties,) there can be little doubt that some few errors of judgment will occur, and tempting fallacies obtain a temporary advocacy; but like the subject of present remark, sad experience will in the end prove the frailty of the reed on which they rest.

CHAPTER IV.

On the Distillation of Rum in all its branches, colouring and imparting a good flavour, &c. &c. &c.

It has been truly said that nothing is (ought to be) lost of the cane on a sugar estate, and when we notice its progress from the field through the mill, boiling and curing houses, until its juice is transformed into sugar, (by the aid of its own trash used as fuel,) and its molasses, and every particle of refuse, in the distil-house, are collected, economized and converted into rum, leaving absolutely nothing, from which anything can be extracted, or turned to account; even to the making of manure for the next crop; when we mark all this, we cannot but be struck with the singular value of this plant, and the excellent adaption of all the working details on an estate, in this, its double manufacture.

But it is the ***still-house***, where its very ***essentials*** are *literally* formed of the scum and refuse of the other manufactory, and which notwithstanding yields, at a small cost, so rich a return, as on *some* estates, in the olden time, to have paid the expenses of the season, leaving the crop of sugar as clear profit.

It is very certain, that this could happen but seldom: but that it should happen at all, shews in an astonishing manner the great value of a distil-house to an estate: and it may readily be inferred that no West Indian Estate was without one. Amongst all the famous West Indian rums, that of

Jamaica always has been, and still is, the most celebrated, and consequently commands the very highest price in the markets of the world: yet few imagine the very great difference that exists in the quality of Jamaica rums. One estate, with the same apparatus, advantages and skilful management as its immediate neighbour, half a mile distant, makes quite a different quality rum, perhaps better or worse, whilst the north and south sides of the island produce a spirit *totally* unlike; the former being infinitely superior. In India it is common to hear people express their surprise at their wretched molasses spirit (which they call rum) not equalling the rum of the West Indies, whereas the idea is as absurd, as the expectation of effecting an impossibility can make it. Let us consider what are the materials used in a West India still-house, and compare them with that of the East. First then we have the fine fresh skimmings of the cane liquor from the boilers, the scum, and precipitates from the clarifiers, and the rich, fresh and unadulterated molasses from the curing house, which after the first day's distillation are strengthened and enriched by the addition of the light, clear dunder (or redundár,*) which the still contributes in the form of wash, from which the spirit has been extracted.

These "set up" in well ascertained proportions, with every advantage of a dry, warm, well appointed fermenting house and skilful management, are the common necessaries of a West India Still-house. In India, the common, fermented, sour, and trebly adulterated draining from *doomah*, or from date sugar, known by the name of molasses, forms the *sole* material in the first "setting up," which is afterwards somewhat assisted by its own very inferior dunder. In some of the large sugar refineries conducted by Europeans, the treacle is certainly of a better description, but bears not the

* A Spanish word, literally signifying, to redound, to contribute.

slightest similitude to pure molasses. In refineries working from cane stuff alone, much might also be gained from the refuse of the *khar* and *goor*, which would be available for still-house use, in setting up liquor, but I know of no refinery that does not use date *khar* very extensively, and thereby much prejudice their treacle for distilling purposes. Excellent distillery men, old West India planters, are in the country, who have erected distilleries, and done all that skill and good management can accomplish to improve the quality of the spirit, and *have* exceedingly improved it; but to these I may address those well known lines, in "*Lewis's*" elegant translation:—

"Alas! dear Sirs, you try in vain,
Impossibilies to gain;
No bee from Corsica's rank juice,
Hyblæan honey can produce."

Nor can these gentlemen *ever* succeed with such materials in making other than a common "treacle spirit," which parties may call "molasses spirit" if they please, but to dignify by the name of "*rum*," is a wilful absurdity.

As sugar estates conducted by Europeans become more common in the country, so may we expect to find an improvement in this branch, and I do not think that any one embarking in a sugar cane cultivation should be in any way discouraged from adding a distillery to his works on the score of East Indian spirit obtaining bad and unremunerative prices; for if my brother planters will only consider the undeniable truth contained in the foregoing remarks, they must see, that it would be out of the question to apply those low prices to that superior description of spirit, which it would be in their power to make, and which might most justly be titled "*rum*."

Their's would be the pure, unadulterated rich molasses with the boiler skimmings, and other stuff, the same as used in the West, and if they did not make a good rum, it would be

their own fault, and not chargeable on lack of good material. Why then with every requisite should they not make good, strong, and well flavoured rum in the East Indies, and why should not such rum obtain a respectable price in the home market?

The home dealers are experienced men, and quick at detecting a superior article; they would assuredly no more let such improved flavour escape their notice, than they would refuse to pay an increased price for it; both are as reasonable as they are certain, and as certain as reasonable. In a very short space of time a name would be established, which would be another material advantage, and as the rum was permitted to attain age, and gain the additional excellence resulting therefrom, the rivalry betwixt East and West, would yet more nearly approximate.

Estates are now springing up in abundance in India, Penang, Province Wellesley, Ceylon and other adjacent places, whose proprietors or managers may find an interest in having a plain exposition of facts laid before them, ere they decide on adding a distil-house to their Estates, and I shall therefore enter on this enquiry with all brevity and conciseness. According to late accounts received from the West Indies, I find that in the Agricultural reports there is an increase of 30 per cent. expected from their molasses, which is to be re-boiled, and all the sugar extracted previous to being sent into the distil-house, but whether this large proportion can in practice be realized, is most doubtful, and it has yet to be proved how far such a proceeding would be profitable.

A Jamaica estate making 500 tons of sugar, would give something like 40,000 gallons of pure molasses, or 40,000 gallons of rum; which in the home market, would most probably fetch 4 shillings a gallon, or 8,000*l.*, from which manufacturing charges, freight, &c., would have to be deducted, say something considerably below 1,000*l.* for all costs.

To re-boil these 40,000 gallons, even allowing for argument sake, that 30 per cent. *was* obtained, the out-turn of inferior sugar would be 12,000 gallons, or something like 652 cwt. which at 26 shillings per cwt. in bond, would yield 815*l.*, leaving manufacturing charges, freight, &c. &c. to be deducted. To this 815*l.* gross, may be added the value of the inferior or second quality molasses, or treacle, which in quantity may be (allowing the low rate of 5 per cent. for waste,) about 16,600 gallons for sale or distillation, and in value say equal to making 12,450 gallons inferior rum, which under the same circumstances, would fetch 2*s.* 6*d.* a gallon,* or something like 1,606*l.* exclusive of manufacturing charges, freight, &c. &c. I will not add more to this comparative shewing, for it seems to me to carry, on the very face of it, a decided answer to the question of re-boiling in the West Indies. But many will say that 4*s.* is a very high price, calculating as I have done, but I can assure those persons, that I have often seen rum, of only a few months' old, sell in Kingston, Jamaica, (by the puncheon) at from 4*s.* to 6*s.* per gallon to the retailers, who on their own account, pay Government a sum of something like 30*l.* sterling per annum† for their license to sell. The tax on the manufacturer is very light for rum they sell in the island; the license tax making up a large revenue.

Sugar estates in India are supposed to have every requisite for making a well-flavoured rum, as well as their rivals of the West, and it rests then to consider how far the above remarks are alike applicable.

In establishing a distillery here, application must be made to the authorities for permission so to do, and this is usually granted, on the superintendent and proprietor entering into a joint bond to abide by certain rules and regulations, imposed by the Board of Customs, and depositing the sum of

* Perhaps 3*s.* might be obtained.

† This licence tax I state on memory.

rupees 5,000 as security against infringement; besides this, the distillery is subject to the strictest *surveillance* of the Custom House Peons, two of whom are located on the premises, and watch every drop of spirit that is delivered from the still. Periodical visits are also made by the Darogah to inquire into the state of things, and enable him to make his report. Once a week his presence may be expected, and through him orders are obtained, from the higher authorities, to ship, or otherwise dispose of the spirit on the premises, as without this official permit, not an *iota* can leave the distillery; nor is a less quantity than one thousand gallons allowed to pass at a time, and even *that* is seizable if found to be under proof. In and about Calcutta the salaries of these Custom House Peons are defrayed by Government, the distiller having to provide them with a house only; but in the country the establishment has to find houses for, and pay salaries to, not only the two peons at 8 rupees each, but the Darogah also at 16 rupees per mensem, making 32 rupees a month for being watched. Of course, sugar estates would have to submit to this latter expense, if contemplating the maintenance of a distillery; and although a statement of these rules is strictly called for here, yet an enquiry into their wisdom, or the immaculate honesty of the subordinate officers employed, forms no part of my object in this work.

The deposit of rupees 5,000 sounds very harshly on the imagination of an intending distiller; but when we consider that this sum may be in "*Company's paper*" *bearing interest*, a great portion of that feeling becomes reconcilable, especially if the rate be high.

These are the real legal disadvantages under which a distillery labours in India, to which may be added the fact, that the spirit, however bad it may be, cannot be re-distilled unless a requisition be sent in to that effect, and permission granted; the deficiency is *then* allowed to credit.

With the foregoing brief remarks, I will now proceed to explain the working details; and although I shall be happy if I can suggest anything useful to those engaged in distillation alone, yet my observations are more particularly directed to the guidance of planters in management of sugar estates, who have the means at their disposal of working on the whole of the usual material.

The *erection* of the distillery is the primary object, and to combine every thing that is simple and economical with that which is most efficient and lasting, is what is demanded by the planter in the out-set. Years of experience and probable loss in his own proper person, will only bring him in the end to the same point at which he may at once arrive by availing himself of the well-tried experience of others. Grievous loss and lasting disgust have often been entailed by an exhibition of wilful obstinacy in this particular, and I would therefore strongly urge the importance of commencing on a general principle and detailed arrangement, which can be justified by the successful practice of many years.

By following this line of conduct, we may expect to do well of a *surety*, whilst speculative theorists succeed by *chance;* I therefore recommend to my brother planters nothing but what has my own practical experience to confirm it. The distil-house, as I before laid down, should be *warm, light and dry*. The fermenting vessels, *cisterns* sunk in the ground, and the distilling apparatus, a common still and double retorts. I may perhaps mention a simple though material addition to this latter; but as it does not alter the principle or general arrangement, I will leave it until I advance a little deeper into my subject.

At the commencement of crop, the skimmings from the boilers and the precipitates, with the washings of the clarifiers flow along the skimmings gutter* into the still-house, and are received in the first vessel, termed the skimmings re-

* See Plate iv. in Vol. ii.

ceiver, (as shewn in Plate 2,) where it* accumulates until nearly full, when it is turned off into the next empty one; the full one being allowed time to settle and clarify itself. When this is found to be perfected, it is drawn down into one of the fermenting cisterns, and the first molasses that can be obtained from the hogshead first potted, is immediately added to it, and preserves *it*, and the succeeding additions of skimmings for some days (until sufficient molasses has been realized, to commence setting up a few cisterns.) At the beginning of crop, (should no old *dunder* be on hand from last year,) the cisterns are cold, and what is termed, out of season, and consequently take sometime in settling a fermentation, for which reason, it is a common practice to put a quantity of cane trash into the empty cistern and set it on fire, whereby the cistern is slightly heated, whilst others put hot-water in, to induce a more early fermentation.†

Old customs are sometimes very well, and this, anent hot-water, is not a bad one, where the house is cold; but the fact is, the cisterns are out of season, which is, their wood is not so tainted as to affect the new year's liquor, and bring on a speedy fermentation. However, the second setting up, does away with this want, and the cisterns are then termed, seasoned for crop. A portion of *dunder* saved from the last crop, instead of being thrown away, materially assists in bringing on a fermentation, and at the same time adds much to the flavour of the rum.

Crop commencing Monday morning at 5 o'clock A. M. would have the boiling-house at work by 7, and fire called to the boilers by 9 or 10 o'clock A. M., and would consequently have next morning (with a powerful mill and two sets of boilers) 3 or 4 hogsheads or tons of new sugar to pot, which

* The mixture.

† The hot skimmings are a great assistance in heating them, but sometimes filling the cisterns with green trash from the mill yard is a good plan, as it speedily begins to sweet and steam, warming the cisterns thoroughly, they are then very slightly limed, and filled with wash.

would in 24 hours have given a sufficient quantity of molasses to preserve the skimmings sent into the still-house from spoiling.

But if the skimmings should betray symptoms of acidity previous to the curing-house supplying any molasses, a little lime may safely be applied to arrest fermentation, or vapour of sulphur may perhaps be more advisable, as being less injurious and more effective, besides it will not require any molasses to be added. If an abundance of skimmings accumulates on you, take a few old puncheons or hogsheads, and draw it down into them, taking care to burn a few sulphur matches in them immediately before filling each cask, and their contents will thus be preserved until molasses sufficient has drained to commence setting up cisterns. This is the first step; viz. to preserve the first skimmings until molasses is ready to set up with. Immediately the supply of this latter warrants draw down into the fermenting cistern, *direct*,* the quantity of skimmings your stock will afford, and add molasses and water according to a fixed per centage. Thus the first duty of a still-house superintendent is to discover what rate per cent. yields best in the house under his management: this is done by setting up different marked cisterns at different rates per cent. of sweets; viz. molasses and skimmings, and by keeping a memo. of their time, rates and return in spirit, to judge which affords the best return, in point of time, sweets and fuel consumed. This is easily ascertained, and when once settled by an experienced hand, continues perhaps for years on the same standard. For instance, say on an estate, I found 10 per cent. molasses with 20 per cent. skimmings answer best. I would expect to see an entry in "distil-house book," to something like the effect shewn in the annexed account of weekly work done on an estate making 500 tons per annum.

* If sulphur is used, the skimmings will require to be slightly heated to get rid of the sulphur, which would otherwise prevent fermentation.

(*Say*) *Distil-house Book for* ——— *Estate, Crop* 1814.

JAMAICA.

Days of Week.	Date.	Molasses on hand.	Skimmings received.	Molasses used.	Skimmings used.	Dunder used.	Water used.	Total galls. wash per diem.	Cisterns set up.	Rate per cent. sweets.	Cisterns run off.	Rum produced.	Over Proof.	Rum on Estate. Punch.	Rum on Estate. Galls.	Used on Estate and ullage.	Sent to Wharf.	Remarks.
		Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls. 2,000			Galls.	Pc.					
Monday, ...	1st.	200	1,000	400	800	1,800	1,000	4,000	2	12	1½	350	25	..	..	..	..	Ten per cent Molasses and 2 do. do. Skimmings=12.
Tuesday, ..	2nd,	100	1,000	360	1,200	1,800	640	4,000	2	12	1½	350	25	..	..	..	..	
Wednesday, ..	3rd,	100	800	160	800	700	340	2,000	1	12	2	400	30	As this may happen.				From 4 A. M. to 10 this night.
Thursday, ..	4th,	..	1,000	400	800	1,800	1,000	4,000	2	12	1½	320	20	..	..	..	..	From 5 A. M. to ½ past 8 P. M.
Friday. ..	5th,	100	800	160	800	800	240	2,000	1	12	1½	320	20	..	..	..	..	Ditto, do. do. do. do.
Saturday, ..	6th,	..	1,400	360	1,200	1,800	640	4,000	2	12	1	230	25	..	..	..	..	Saturday night washing down in boiling-house; *proceeds* preserved until Monday morning.
Week's Total.	Work.	..	6,000	1,840	5,600	8,700	3,860	20,000	10	12	9	1,970	..	..	..	..	..	

MEMO.—19 Puncheons and 70 Gallons Rum made this week, and 20,000 Gallons Wash on hand, with 400 Gallons of Skimmings and Boiler Washings, &c. &c.

I do not aim, in that weekly work, to shew more than what is *likely*, for circumstances may so much alter the whole material employed, as to call for a corresponding alteration in the proportions. I estimate good average skimmings received in still-house to be in comparison to molasses as ten to one: one gallon of molasses being about equal to ten gallons of good average skimmings. Porter and Fitzmaurice, estimate it at *five* and *six*, and Roughley at eight to one: but I am persuaded that the average of a crop would more nearly approach *ten*, which I therefore take as my rule in "setting up." Immediately the skimmings receiver has had time to clarify its contents, the cock is turned, and the liquor runs off quite clear and luke-warm (generally,) into the fermenting cistern; next the quantum of molasses is discharged from molasses receiver, also by gutter, then the clear *dunder*, and lastly the water, which should be soft and pure.

The cisterns being built square, as mentioned before, a measuring rod or staff, say eight feet long, two inches broad and half an inch thick, should be provided, and the exact depth of the cistern taken on it, and this marked off again (if a thousand gallon cistern) into ten deep lines denoting hundreds, and betwixt these by lighter ones denoting tens; each line having in its centre a slight perforation to admit of a small nail being stuck in for a mark. In this manner drawing down your skimmings you place the nail at the second large line, and direct the stillerman to stop the cock as soon as that quantity, viz: 200 gallons, has been delivered; then for the molasses put another nail at the next deep line, which hundred gallons is given the same way; next for *dunder*, the bottom nail is moved up to the desired quantity, say 500 gallons more, and lastly the remaining 200 gallons is filled up with water. By this method the European superintendent has only to mark the different stages with the nails, successively, for the workman to understand perfectly how much of each he is to give.

If the skimmings abound, and can therefore be afforded, 300 gallons will be desirable, with 90 gallons of molasses, 400 gallons *dunder*, and 210 gallons water, in setting up a thousand gallon cistern, or tun. Some still-houses work best at 10 per cent. sweets, others at 12, whilst others again range from 14 to 15 per cent., therefore as I said before, experience must teach this: however, my own idea is, that for India 12 per cent. molasses, and 20 per cent. skimmings (or 14 per cent. sweets in toto), is the best proportion a new beginner can commence on in practice; always bearing in mind that the first round of the still-house at the beginning of crop, requires to be set rather lighter, as the cisterns are cold and out of season; but after that, the rate can be increased to the desired standard, and the house will soon exhibit its capabilities and requirements. Cleanliness in a still-house is one of the chief *necessaries*, for without that, an acid taint gets in, and ruins everything; then come anxiety and loss, every vessel must be emptied, scoured out and doubly white-limed, until the whole, from skimmings gutter to still, are thoroughly cleansed and the taint eradicated.

A fresh start must be made, and all old *dunder* rejected; in fact, it is a most annoying and vexatious occurrence, which can only be chargeable to gross neglect and bad management. The gutter from boiling-house, should be washed thoroughly every night, and white-washed with lime water; the skimmings receivers, well washed and scrubbed every time they are emptied, the cisterns also, with all moveable gutters, pumps, &c. &c. Too much care cannot be taken, and this must also extend to the molasses and *dunder;* one drop of rain or other water must not be suffered to mix with them, until they reach the fermenting cisterns, otherwise they are sure to be much injured.

The question of *dunder* being conducive to the good flavour of rum, has often been discussed, and many old authorities even say, that it injures the flavour, though it in-

creases, the quantity of the spirit.* To this opinion I cannot subscribe, in fact I believe it to be totally incorrect, and opposed to every-day experience. In Trelawny and other parishes on the north side of the island of Jamaica, the very finest flavoured rum is made, and although this may and does arise from more than *one* cause, yet to my own certain knowledge, the planters there use a far larger proportion of *dunder* in setting up their wash, than is common on the south side. Having myself been a planter for some years on the south side, I afterwards was appointed to an estate on the north side, and remember well how surprised I was at finding so much *dunder* used in setting up wash, and how it, at first, shocked my ideas of still-house management; but I quickly found that my former notion was quite erroneous, *and that if the dunder was good and light, there was no necessity for using any water whatever in setting up a cistern.* Water becomes necessary when the *dunder* is dark and heavy, otherwise the liquor will work too sluggishly in the cisterns, and take too long a time to "*die.*" These distinctions are apparent to *practical* men at first sight, and *here* it is indeed where practice avails, the entire *absence* of water, or a greater or less requirement, is indicated at once by the state of the materials, and the manner in which they behave whilst undergoing fermentation. This will be better understood when I explain, that sometimes a cistern will work so slowly or heavily (as it is termed,) as to take two, three, four, five, and sometimes even six weeks, before it becomes ready for the still; whereas from six to eight days is the usual, and proper time. If set up at a high per centage, ten days is not uncommon, and I think it not unlikely that the proportions I have named, as suitable to East Indian estate's-distilleries, may cause the cisterns to occupy that space of time.

* See Porter and Bryan Edwards.

I do not intend that a planter shall confine himself to my per centage, but if inexperienced, try *that first*, and in a few days after first returns are shewn, experimentalise on a few different per centages from *ten* upwards. From what I have before said it will be seen, how imperative this trial is, and moreover how necessary it is to attend to it oneself, instead of trusting irresponsible and careless subordinates.

The process of fermentation is one of the most singular instances of matter acting on matter, and by the aid of elementary influence changing each its character, until the transformation, effected by the general operation, places it in a position to accomplish after a season, yet *further* transformations, and thereby produce various new compounds.

That fermentation which takes place in a distillery, exhibits in a remarkable manner the metamorphosis that its various components undergo. I have it not in my power at present to furnish a correct analysis of good average wash; but in the scum and precipitates from clarifiers, skimmings from boilers and *dunder*, we have a number of bodies combined, whose peculiar action on each other, during the process of fermentation, is of a most interesting character.

From the resinous aromatic gum, resident in the rind of the cane,* the well known flavour of rum is generally understood to proceed: but this is very different when a spirit is manufactured from molasses alone, for *then*, although no trace can be discovered of this distinguishing aroma, yet a very plentiful impregnation of an empyreumatic oil is disagreeably perceptible. This is accounted for by the pernicious transformation effected on the resinous gum contained by the intense heat of the boilers, during its passage through them. In the skimmings this action has been but exceedingly partial in consequence of the comparatively very slight degree of heat it has been subject to.

* Volatile oil contained in plants is changed into resin by the absorption of oxygen. (See Leibig.)

Besides this essential oil of the cane, we have reason to believe, that a further accession is gained during the process of fermentation, from small pieces of the cellular tissue in the wash generating an essential oil as its decomposition takes place.* I have myself no doubt that such is the case, and a few simple reasons for my belief may suffice; for instance, in making rum with a very rich perfume of pine-apple, it is only necessary that we put the bare rind of the fruit into the fermenting cistern, and let it remain there until the process is completed: this is only that the rind in which the essential oil resides, shall as it decomposes impart to the wash its peculiar flavour, which it then does, abundantly and freely. This fermented wash, so impregnated, yields on distillation what is generally called "*Pine-apple rum.*"

Peach rum again, is made by placing the skins and kernels of the fruit, with the blossoms, into the fermenting wash, by which the essential oil is separated and becomes incorporated with the wash, by which its characteristic perfume is secured to the distilled spirit. Indeed this change of flavour may always be influenced at pleasure, and a good distiller knows well how to improve his crop in this manner, so as to command a very superior rate in the market, without having recourse to the various deleterious compounds which are used by less able, but more dishonest operators. In making use of the essential oil of foreign auxiliaries, it should be borne in mind, that the flavour is very fleeting, and in no way to be relied on, whereas that obtained from its *own* plant, the cane, is its *natural* aroma, and not so readily volatilized; therefore it is in my opinion, a good plan to have a small quantity of the cellular tissue of the cane thrown into each cistern set up.

In some canes this resinous gum (and essential oil generated on fermentation) more particularly abounds, and has a

* See Leibeg and Ure.

very pernicious effect on the sugar and rum made therefrom, the latter in such case must be peculiarly treated, as I will shew in its place.

When the cistern is set up in proper proportions, the wash must be well stirred up and left to ferment, taking care to skim off all the scum and dirt that rises during the process until in about eight or ten days the liquor will be fit to distil. It is then pumped into the still and the two retorts allowed a few gallons of low-wines; fire is placed, the still boils and the steam passing into the first retort, heats its contents, and then proceeds in like manner to the next or second retort, which, when fully heated, rises the spirit vapour through the escape pipe, which is joined to the worm in the condensing tank, and by it is conducted into the distil-house can-pit, where it is received into cans holding a fixed measure, (generally 5 gallons,) and transferred to the rum butts. The strength, of the spirit ensuing, is tested either with the hydrometer, or the common proof bubbles (*or beads*), and as soon as it becomes too weak for the rum required to be shipped, it is then thrown into the low-wines butt, until no more strength is perceptible in the running.

The quantity of low-wines obtained in this manner from a still with double retorts is very seldom more than sufficient to charge the retorts with next time; for instance, a still of 1000 gallons, and two retorts of about 80 and 70 gallons each, on the commencement of crop would require say 10 gallons of water* in the larger and 7 gallons in the smaller retort, and the still loaded with wash, the return from which, the first running, would perhaps be, say 100 gallons of rum 30 per cent. over-proof, and from 70 to 80 gallons of good low-wines. The second charging of the retorts would then be of low-wines, about 40 galls. into the larger and 30 into the smaller, and the still with wash, the return from which would

* Water is merely put in, as no low-wines are supposed to be on hand.

be most probably 120 or 130 gallons same proof as before, and continue thus (according to the strength of the wash) constantly.

It is a bad plan to put too much low-wines into the retorts, as it is liable to blow over the helm, or if it does not do so, it may materially injure the flavour of the rum in another manner; viz. by imparting to it a strong taste of low-wines, or more correctly speaking, an empyreumatic odour. The proportion therefore may more advantageously be taken perhaps at 35 gallons for the one, and 25 for the other; besides by this, only 60 gallons of low-wines will be required (or 12 cans) to be taken off, after the rum is finished, consequently the low-wines will be very superior, and will in the next running produce better flavoured rum. To understand this, it must be explained, that as the low-wines run off, each succeeding can is weaker, and more abounding in this empyreumatic oil, than the preceding one, and as it comes towards the end, the last can or two (though containing some little strength) are of such very bad quality, as to injure very much the flavour of the foregoing cans, and can therefore be well dispensed with.*

I have seen a still-house book-keeper working with such apparatus, improve on this plan, by placing wet cloths or swabs on the top of his second or smaller retort, and every now and then dashing them with cold water from the receiver, especially towards the middle of the rum running, when the spirit was getting weak, also with the low-wines. I consider it a very good plan, and one that might well be followed up, and better regulated, in the application of water to the second retort. In addition to the still and double retorts, a great improvement may be made by having a "charging condenser," otherwise called a "*wash heater*," attached. This should be placed betwixt the 2d retort and the condensing (water) cistern,

* Some people throw salt into the liquor about to be distilled, to improve the spirit.

and is nothing more than a long cylindrical vessel (either of copper or wood), which is three parts filled with wash, and through which the pipe from 2nd retort passes, on its way to the condensing cistern. The heat of the spirit vapour passing through this pipe, heats the wash in the "charger," and brings it, by the time the still is run off, to the boiling point; when the still being discharged and retorts reloaded, the heated wash is drawn down into the still, and the work proceeds. The charger is again loaded, and as the spirit distils over, and passes into the still-house, so does the wash again become heated, and arrives at the boiling point, by the time the still requires re-charging. Care must be taken that the wash in the charger does not become too much heated, or the vessel will burst, if not provided with an escape pipe: this latter is common in the West Indies, and is usually conducted through the condensing cistern into the still-house, where it delivers the spirit it has distilled over. But perhaps it will be found sufficient to bring the wash in the charger *just* to the boiling point, and *no further*, so that when the still requires re-charging, the boiling liquor is transferred into it, in all its strength.

To compass this, it is only requisite to determine the length of pipe which is to traverse the charger, and so regulate it, that the contents may just arrive at the boiling point as it is required. Never mind if it is even a degree below that, as it will be safer and make very little actual difference in time, &c.

This is very easily done, and it will be apparent, that by this system of wash-heating, much time and fuel are saved; and a still with double retorts which runs three times a day, with this improvement may run off five or six charges in the same time, and with much the same fuel. The charger should, as I stated above, be only three parts full to allow for expansion, and prevent accidents; although the escape pipe and loaded valve would always ensure safety, and at the same

time prevent the loss of any spirit vapour. A good stout cask, holding as much as would fill the still, and one-third more, (if unprovided with an escape pipe,) is all that is necessary; but if any apprehensions *should* exist, then let the cask be large enough to hold only 50 gallons more than the still, and in centre, place a copper pipe, (three inches in diameter,) which carry up at least five feet perpendicularly, and then downwards (two inches diameter,) through the condensing tank, into still-house, so that if any spirit distils over, it will be received in the can pit. In hanging the still over its furnace, a distance of 20 inches, between bars and still bottom, should be allowed, if *coal*, be used, or 30 inches if *wood:* the heated air and smoke from the furnace instead of going up the chimney direct, are conducted by a flue all round (the side of) the still, so as to give the still the benefit of all the heat possible.

A thousand gallon still and two retorts, *well hung* and furnished with a "*Charger*," should run off six charges a day, making (with wash at 12 per cent.) say about 700 gallons of rum 30 per cent. over proof, in that time, cost of such apparatus may be estimated as follows:

New copper still and worm very best workmanship, ...	Rs.	4000
Two wooden retorts (white pine) with copper pipes *about*, ...	,,	200
Wooden charger with flanges and escape pipe say, ...	,,	300
Whole apparatus Total,...	,,	4500

When all the strength of the wash has been distilled over, the fire damped, the steam plugs, or cocks of retorts are withdrawn or opened, and then the "*Man-door*" of still is taken off, and the spent wash (now called *dunder*) is drawn down into the dunder receiver: taking care to stir it up well

before it leaves the still, otherwise a great deal of dirt will be left at the bottom. The retorts are emptied of their contents, (now called *lees*) by turning the cocks, at bottom; which lees, are carefully conveyed off by a small gutter, as they are very corrosive, and cannot be made use of again. All this being effected, the still and retorts are reloaded, and the operation continues over and over again. The *dunder* from still is, as I before said, drawn down into *dunder* cisterns, situate *below* the level of the still, and after becoming partially cool, and settled, is pumped up into other receivers immediately above them, and there remain to cool perfectly, and clarify, until required in still-house for setting up wash anew. These *dunder* receivers are, always, to be under shelter, and by erecting them as described, (the upper exactly above the lower), one small shed will answer for both sets. Sometimes more *dunder* collects than can be contained in the *dunder* receivers, and it is then common to draw down a quantity of it, into any empty fermenting cistern in still house, until it is wanted to set up with. This more particularly happens when the *dunder* is of a fine, rich quality, and should there be a few empty cisterns available, it is divided amongst them, giving each first as much as will suffice to *set up* that cistern as soon as the other materials are ready.

Plenty of good light *dunder* should always be kept on hand, for very often, from a variety of circumstances, heavy, thick and bad *dunder* may result from still, which must be all thrown away, and not allowed to come into use again, on which occasions the good *dunder* that has been carefully husbanded, comes into service. It was a common practice of my own, and many other West India planters, to fill up all cisterns, one by one, towards the end of crop, by which plan the cisterns were kept *in season*, and prevented from leaking, whilst the old *dunder* came in admirably at the

commencing of the next crop, for the first round of the house. Using old *dunder* in this manner is perfectly safe and altogether advisable, but care must be taken not to give too large a quantity of it to each cistern, or the fermentation will be heavy and long in working off: therefore in a thousand gallon cistern, at starting, the proportion may be, molasses 60 gallons, skimmings 400 galls. *dunder* (old) 240 gallons and water 300 gallons, which will work light, and quickly. As soon as *new dunder* can be had, throw away all the old stuff, as the cisterns containing it come into requisition.

When the still boils, the loud rumbling of the retorts gives intimation of the fact, and warns the stillermen to prepare for the spirit in the can pit: the fire, if burning strongly, is slightly checked, clean cans are placed in readiness, (one being under the pipe,) and the superintendent stands by with his proof bubbles, ready to test the strength of the spirit. It now begins to run, and a strong empyreumatic flavour is perceptible at first, therefore the first half a can, ($2\frac{1}{2}$ gallons), or can, is thrown into the low wine butt, then comes, the strong rum, varying from 40 to 55 over proof.

First the 16 bubble, then so many cans of the 17, 18, 19, 20, 21, and 22, in succession, according to the strength of the spirit to be shipped. If 30 per cent over proof is required, directly the 20 bubble rises in the proof phial, cease throwing the spirit into the rum butt, and instead, let the succeeding cans be thrown into the low-wine butt; but if *proof* rum be wanted, then the spirit may continue to be taken to the rum butt, until the 28 bubble rises, which will bring it to 23 (generally,) allowing one bubble for coloring, and one for evaporation, in all bringing it to the 25 bubble or proof.

The London and Glasgow bubbles vary from each other much, the former being much stronger; a short time since

I tried a box of Liverpool bubbles by Sikes' hydrometer, and found that,

The 17	Bubble or bead was rather over		42	over-proof.
" 18	Ditto,	... ...	37	ditto ditto.
" 19	Ditto,	.. ..	32	ditto ditto.
" 20	Ditto,	.. ..	26½	ditto ditto.
" 21	Ditto,	... ...	21½	ditto ditto.
" 22	Ditto,	... ...	15½	ditto ditto.
" 23	Ditto,	.. ..	10¼	ditto ditto.
" 24	Ditto,	... ...	5	ditto ditto.
" 25	Ditto,	... ...	0	proof.

But many of these proof bubbles are very bad guides, and full many a time and oft have I had trouble in getting them near the truth, grinding some, and adding to others according to a good old set. By taking this trouble they are brought to answer very well, and are generally used in the West Indies, whereas Sykes' hydrometer is very uncommon; I imagine in consequence of its being so very expensive. Our rum in Jamaica when intended for shipment to England, was generally sent to wharf at a strength that would cause the 19 bubble to sink down freely even when colored: or about 30 per over proof. Other times again it was put up at what we called "market proof," in which the 23 bubble would sink.

It is a generally received opinion in the West Indies, that rum put up for the home market at 30 per cent. over-proof, was of a superior flavour to that set up at a higher strength. This opinion was so strong, that in putting up rum for the house use, on estate, a few cans only would be taken from each running, (mostly on the 19 and 20 bubble,) until the puncheon was filled. This rum so taken, was termed the middle runnings, as being neither very strong, or very weak; and was considered that which would turn out

the finest flavour, when it had acquired age. I think that no good is gained by sending the spirit from India to England so strong as they usually do. Thirty per cent. over-proof when colored, is, in my opinion, the best, *paying* strength to ship at.

When the rum is running from the still, it is a good plan to let it run into a deep narrow basket, or cylindrical box filled with layers of charcoal, coarse at top and finer below; which serves to free the spirit from a great deal of that empyreumatic taste, so apparent in new rum. Some take great pains in improving the quality of their rum, and to my own knowledge the trouble is nothing, positively nothing, when the wonderful improvement of the spirit is considered.

One of the most safe and efficient of these plans I will notice, as I know that it was so successfully practised as to cause rum only a few months old to sell as two and three years' old, even in the Island (Jamaica.)

The rum as it came from the still was received into a deep basket, containing layers of charcoal, through which it drained into the cans beneath, and was carried off to the rum butt, fixed at a good elevation. Here it was (when the butt was filled) treated with a little caustic alkali, and some grained charcoal, well stirred up, and permitted to rest for a few days. It was then drawn down by the cock, (in a very small drippling stream,) through a pipe 20 feet long, stuffed with alternate layers of grained charcoal and sand, into a white oak butt, the inside of which had been well charred. If the butt were large it would take perhaps a couple of days to run off, or probably more, however two days and two nights generally sufficed for a moderate sized butt.

When it had all run off into the lower tier of butts, the spirit was again treated, according to taste, and improvement, with a small quantity of sweet spirits of nitre, tea leaves, and other little matters that are not particularly

essential. It was then colored, and remained ready either for shipment or sale.*

If intended for estate's use, it would be diluted with water, (which had been boiled, and had had a few avocada pear leaves in it,) to the general standard proof, or 25 bubble; otherwise to the 28, or even 30 bubble. And when all had been done, it was sent from the still-house to the manager's dwelling-house store, for use. If the improvement of rum be of value in the planter's estimation, as it should be, he ought to attend to this, and have the rum store so constructed, or rather the rum butts so arranged, that one tier of butts should be above the other, sufficiently high as to allow of the entire transmission of the contents of the former into the latter, and again from the lower into puncheons or hogsheads for shipment or sale. The highest butts (being 6 feet high,) would require therefore to be on a platform of 11 feet high, and the lower, on a horse of 4 feet. Three or four butts on the upper tier will be quite sufficient, and on the lower, double the number; whilst it must be remarked, that each butt requires to have a large hole at the bottom, to drain it off and cleanse it out thoroughly, occasionally; also that the cock must be placed some 6 inches from the bottom, otherwise a great portion of the dirt and other matter which has precipitated, will be again put in motion, and drawn down with the clear spirit.

Colouring rum is another very particular part of a distillerman's business, and accordingly should be strictly attended to, for I have often known really good rum spoilt by bad color.

The best sugar for making color, is that well grained brown sugar, (not too dark, nor too fair,) commonly used in Jamaica for this purpose. It is put into a copper or iron

* A loss of strength was always sustained by this method, varying from *one* to *two* bubbles; but the improved flavour was so material, that it sold as *old rum* in the market.

boiling pan, and heat is applied; one man stands by with a wooden staff and stirs it about continually, from the moment it begins to warm until it is finished; another makes the fire, which should be of cane trash, and instantly checked at will. The boiling goes on changing the color of the stuff from brown to a deep black; bubbles rise, large and heavy at first, then small and quickly; the wooden stirrer shews the color increasing to its proper shade, and the taste of the operator distinguishes the peculiar flavour desired. This nicety of taste, is the chief part of the operation, as on it depends the manner in which the rum to be colored, will be affected. No sweetness should be apparent, nor should any bitterness, but just the exact medium; arrived at this stage, some strong proof rum is very cautiously added to it by degrees, to keep it in a liquid state, otherwise it will become perfectly hard when cool. This strong rum, then, is added by degrees and well mixed, (the man stirring with might and main, the very smallest heat being allowed under the boiler, but *no flame*, or the rum may take fire,) until sufficient is thought to be given, when the boiler is removed at once from the fire, and its contents emptied into the "*color cask*" in the rum store. The color cask is generally a small hogshead, placed end up, on a wooden horse 2 feet high, and it has a plug-hole about 6 inches from the bottom, in order that its contents may be drawn off clear, and without disturbing any matter that might have precipitated. Well-made color, from good sugar, will require only about three pints to color a whole puncheon of one hundred gallons, and by being boiled with very strong rum, as mentioned, it lessens the strength very little. If a dark colored rum is desired, then more color may be added, until it arrives at the shade required,—but weak, bad color will take sometimes a large quantity to impart the proper color; and besides this, a very large portion often settles at the bottom, leaving the rum only slightly tinged, although ever so well mixed. Good color should be as thick as it can be

without forming a mass, and as clear and bright as possible; mixed with rum, it should at once give it a clear rich tint, devoid of any haziness or muddiness, but to insure this it had better be mixed in a pail with about 5 gallons of rum at a time, then carefully strained, and thrown into the rum butt or puncheon. If the color be good, there is no necessity for coloring rum until it is drawn down into puncheons for removal, when the color can be added, as described. Every batch of rum sent down to wharf, or sold, or otherwise removed from estate, should leave a sample on estate, for reference; which sample can be put into a small phial, corked, *sealed,* and labelled, describing strength, age, &c. &c.

Many people in India make their color from molasses and coarse *khar*, but I cannot approve of the practice, nor can I recommend it; quite the contrary.

Indeed I consider boiling color from molasses a folly that no planter would be led into, who has any pretension to still-house experience; it is a "penny wise and pound foolish" idea, that can only be excused in a young hand, egregiously ignorant in the manufacture and treatment of rum. It is better to throw away half a dozen batches of bad colour, than to allow one puncheon of good rum to be spoiled thereby: and I hope my brother planters will bear that in mind. They must reflect on the trouble and infinite care that is bestowed by the West India planters on *their* rum, and consider that unless such attention were bestowed, they never could expect to realize the prices they do. How much more then is it called for here; where not only good quality, but a *name*, has to be attained? Let East India planters but pay proper attention to the details I have set forth, and strive to improve the quality of their rum for the home market, instead of being satisfied with the horrid stuff now made, which is suitable only for the Calcutta bazars; let them I say, attend to their business and *not be above it,* and I will vouch for their making not only good *rum*, but good sugar.

The business of a sugar planter embraces many scientific pursuits, and may justly be termed *an honorable profession !!* one, of which no man, however well bred, has any reason to be ashamed. A thorough planter is a man of study, who calls to his aid the science of Chemistry, Horticulture and Agriculture; commands the mechanical and other *arts*, and differs from the followers of other learned professions, more in the freedom of his life, and the healthful employment of his time, than in the attainments resulting from education and study.

"Knowledge is power" as well in *plantership*, as in any other course of life that can be named, and I trust my brother planters will excuse my impressing on them the fact, that the more they strive to acquire the *former*, the better planters will they become, and the more successfully will they be able to yield the *latter*, in bringing to perfection the products of the soil they cultivate.

My task is now finished, my book is now complete, and as I have entitled it "*the Sugar Planters' Companion,*" so may it be found, I trust, a companion, interesting and useful. *I have laboured to make it such*, and sincerely hope I may not be disappointed. If I have failed to make myself understood on any particular subject, I shall always be happy to explain matters more fully by letter, to any person desirous of such information, and finally I feel assured, that my endeavours to supply what has hitherto been so much wanted in India, will cause any faults contained in the work to be overlooked, in its general utility, and the good spirit in which it is written.

Correspondence and Selections.

WHEAT AND BARLEY CULTIVATION IN UPPER INDIA.

Extract of a Letter from H. HAMILTON BELL, *Esq., dated Omeghur, near Agra, 2nd October,* 1844.

I was about to address you, (when your Deputy Secretary's letter of the 16th instant arrived,) to notice the result of the trial made with the Indian corn seed you were obliging enough to transmit me, and I regret to say, my report must be unfavourable. I had it very carefully cultivated in several villages, and directed, that in each case it should be sown when the contiguous *kaits* on each side were under a similar cultivation of native seed. In no instance was the foreign plant nearly equally luxuriant, and the kinds of corn are universally smaller and less productive. I have picked out a few of the best for a second trial; but as yet I see no inducement to the introduction of this foreign grain.

I have the pleasure to enclose a statement of the produce of wheat and barley from several villages, more or less under my controul, so that I can vouch for the returns as correct. I have made the returns in bushels per acre, in an allowance of 60lbs. for wheat and 50lbs. for barley per bushel, and this is above the English average, I should think at least 4 per cent.

In looking at this report, you will be good enough to bear in mind, that the wheat crop of this season suffered extremely from an insect, here termed *ruttooa,* and the injury was asserted by the natives to exceed one-third of the produce. I am disposed to think this not much, if at all, exaggerated. The barley on the other hand was generally a very good crop, the insect scarcely touching this, and never if there were contiguous wheat *kaits;* though the latter might suffer extremely. There was no other selection of the kaits than those close to the villages, as the richest and best; and those near the boundaries, generally the most cultivated, were avoided. To this indeed there was one exception in a *kait* of barley in

the village of Dugna, especially selected from its very promising appearance, and this gave the immense return of 100 bushels per acre. I do not think any of the land in the list pays a higher rent than 1-8 per bigah=to about 15*s.* sterling per acre.

I shall have great pleasure in trying the seed you mention as having been forwarded, and have duly noticed Mr. Haworth's report on the several qualities of the wheat received from Colonel Ouseley. I do not perfectly perceive the advantage of its introduction, as two of the descriptions made neither good flour nor good bread; but at all events will give it a trial.

I will endeavour to obtain some information respecting the white linseed. I have never seen nor heard of it; but if grown in this part of the country, I will obtain such details as I can for your information.

Return of Produce in Wheat and Barley per Acre, in bushels of 60lbs. and 50lbs. weight respectively, in the undermentioned villages.—Rubbee Crop of 1843-44.

Zillah and Pergunnah.	Villages.	Bigahs of Wheat.	Bushels of 60 lbs. per Acre.	Bigahs of Barley.	Bushels of 50 lbs per Acre.
MUTTRA, JELASUR.	Ramghur, ..	5	27	3	55
	Ditto, ...	0	0	3	$53\frac{16}{50}$
	Ditto, ...	0	0	5	30
	Sonat, ...	4	25	7	$32\frac{1}{2}$
	Ditto, ...	5	$16\frac{4}{5}$	0	0
	Mohimpoor,	11	$16\frac{4}{5}$	$2\frac{1}{2}$	32
	Rettenhi, ...	10	$22\frac{1}{2}$	0	0
	Rajpoor, ...	14	$29\frac{3}{4}$	15	50
	Raimgan, ...	25	$25\frac{1}{3}$	3	$86\frac{1}{3}$
	Kyrghur, ...	5	$29\frac{1}{6}$	5	50
MYAPOORIE, SHEKONBAD,	Ditto, ...	5	$27\frac{1}{2}$	0	0
	Ditto, ...	11	$25\frac{1}{3}$	0	0
	Dugna, ...	10	$33\frac{1}{3}$	4	100
	Correi, ...	7	$44\frac{1}{2}$	0	0
	Libowa, ...	11	$32\frac{1}{2}$	0	0
	Hatarut, ...	10	25	0	0
	Darsouhi, ...	7	25	0	0
AGRA, FIROZABAD,	Jerrouh, ...	5	$29\frac{1}{6}$	5	50
	Simla, ...	7	$23\frac{3}{4}$	0	0

The rubbee besides suffering from the *ruttooah*, as noticed in my letter, was unproductive from the dry parching winds near the time of its maturity. Generally it was an unfavorable wheat, but very good barley crop. On a variety of returns, the result was superior to the above, but I cannot entirely depend on them.

PROGRESS OF VARIOUS CULTURES IN THE LUCKNOW HORTICULTURAL GARDEN.

Extract of a Letter from Capt. G. E. HOLLINGS, *dated Lucknow, 30th August*, 1844.

Although I have not written to you for sometime, you must not suppose that my anxiety to contribute to the objects of the Society has in the slightest degree abated. I have had many things to attend to, and want of leisure is the only rational excuse I have to offer. With regard to the garden, every experiment has been far more successful than I could have anticipated, and now that I have acquired some practical knowledge, and succeeded in getting the establishment into good working order, I trust that I shall be able to be far more useful than I have hitherto been. Lest I should forget it, I think it right to mention here, that I particularly wish you to send me seeds of all vegetables you may receive from England or the Cape, tulip and other flower bulbs, dalias, &c. &c. I should be glad to receive small supplies of vegetable seeds by letter dâk. Having said what I want, I will give you an account of our proceedings.

The fruit season was very favorable, and productive of a great addition to our resources. The vines, peach and mangoe trees yielded a handsome return; all the grafts of oranges, citrons, lemons, guavas, apricots, &c., succeeded. The cereal grains and vegetables were finer than have ever been raised in the garden. Senna, ginger, and tobacco failed in a great degree, but I hope to be more successful this year. Of the crops now in the ground, the sugar-cane has been greatly injured by white ants, but the plants that have escaped promise well. The cotton plantation is in excellent order, some of the shrubs are in full blossom, and seem to be in the most thriving condition. The maize from the American seed you

kindly forwarded, has been very good.* Every article in the khureef, or autumn crop, is thriving. There never has been within the memory of man, a more favorable rainy season than the present.

All the vines raised from the seed given to me by Sir William Nott, are alive, but very stunted in their growth. I have a seedling planted in the open air in April last, from the grapes sent from Cabool in boxes packed in cotton, which has attained the length of more than eight feet, and all of those seeds which were planted with the fruit entire, but too much decayed to be eaten with relish, have become large and handsome trees. I should like to hear the result of similar experiments in other parts of India. My idea is, that if the whole fruit is grown, instead of only the seed, the decaying portions of it, according to the principle of Liebig's system, afford the best manure.

With the expectation that an enquiry into the causes may lead to useful result, I deem it right to mention, that with the view of astonishing the lieges on some grand occasion, with vegetables quite out of season, I put some peas, pods and all, into one of the ice pits: they were brought to me about a month ago, the box in which they were packed with other vegetables had been stove in. The potatoes and cauliflowers were destroyed; the cabbages were apparently in good order, and the peas were sprouting. I had them placed in the ground, and to the present writing, they are thriving, and promise to yield us an early crop. They were sown on an elevated bit of ground where no water could lodge. Some peas that had not been in the ice were planted at the same time, and have come up splendidly, as also a crop of potatoes. I will let you know how the experiment eventually succeeds, and when we first get peas and potatoes.

* The soil and climate of Lucknow would thus appear to be better adapted for the American maize than that of Agra. A like success has attended the trials of Mr. C. B. Taylor at Rajharra, in the Palamow district; for in a letter under date 28th September, he writes, "The American maize has succeeded well, I have obtained a large quantity of the corn from what you sent me, and next year will be able to cultivate a few fields, and to supply the people in this part of the country with seed. I have had many applications for it, but could only satisfy a few." From Capt. Dunlop's letter, at page 199, it will be seen that the foreign maize has also thriven well in the Cuttack Branch Society's Garden.

We had a very fair specimen of vegetable marrow two days ago, and the asparagus this year has been by far the finest raised at Lucknow.

Your questions about hemp are not forgotten; the fact is, that in Oude, the plant is principally used to produce the drug called *subjee* or *bhang*, and there are other fibrous plants from which rope is made. The common hemp grows in the greatest luxuriance throughout the whole tract of country situated beyond the Gogra.

It is intended to make forcing beds for cuttings and seeds, and I hope to be able to make some successful experiments for raising early melons, cucumbers, &c.

The plan mentioned in the last (August) report of the Society's proceedings for raising cauliflowers, is that which has always been adopted at Lucknow, namely, taking off the lower leaves and earthing up the stalks. I intend to try the effect of bone dust as manure this year.

We have beds prepared for celery in the same way as for asparagus, by digging trenches three feet deep, laying down manure, and earthing up.

Can any one tell how mushrooms ought to be cultivated in India?

English primroses, clove pinks, China pinks, rose Edwards, tuberoses, lilies, and all the most handsome Indian shrubs are at present in magnificent blossom. My dahlias look healthy, and have sprung to a great height, but there is no appearance of blossom yet.

In one of my first communications I mentioned, that I thought I had succeeded in propagating the teak by slips. I was mistaken, for all the cuttings eventually failed; but I have some that were put into the ground in March last, which have sent out shoots, and therefore I hope, although not without a considerable degree of doubt, that I have had better luck this time.

Several of the carnations that I raised from English seed last year are thriving admirably. I have done all in my power to meet the wishes of those who have asked for seeds this year. I hope that in every succeeding season my means will be increased, and our arrangements improved, until the grand objects of the Society are fully accomplished.

On reperusing my letter I find, that I have mentioned the results from keeping certain vegetables in ice, but have omitted to notice the effect of an exactly opposite cause, namely intense heat. When the house in which I was residing, a large puckah one, was destroyed by fire on the 20th April last, many of the trees in the garden, especially in that part of it which is between my house and the one occupied by the Reverend Mr. Garbett, were severely scorched. A row of mulberry trees in all probability saved Captain Shakespeare's house, which is nearer to mine than either Mr. Garbett's or the church, which were both destroyed. It is a curious fact, that with exception of a cactus, there was not a single tree or shrub destroyed by the intense heat and flame. The bamboo frame on which a honeysuckle rested was burnt, and the plant consumed to within two feet of the ground. All the mulberry trees had some branches scorched. In fact after the fire, all that had been green and flourishing, appeared brown and burnt up. But now whether trees or shrubs, those that apparently had been more injured by the fire, are now throwing out the strongest shoots, and the oldest trees are looking young again. The honeysuckle has assumed a far more healthy appearance than it ever bore before.

If any person unacquainted with the Hindostanee language, produces a good practical work on gardening in India, I shall be happy to undertake the translation into Ordoo, if no more competent person offers to do it.

2d October, 1844.

This letter was not sent to the post office as I expected it would have been, on the 31st August, and has been mislaid ever since. The first crop of peas has failed since the rains ceased. A few plants from those that were preserved in ice are alive and in blossom. The teak cuttings have also failed.

Result of Experiments at Cuttack, on Seeds procured from the Society.

To the Secretary of the Agri-Horticultural Society of India, Calcutta.

Dear Sir,—With reference to your letters of the 26th April and 16th July, I have the honor to report upon the seeds forwarded for the Branch Garden at Cuttack.

The Sea Island, Upland Georgia, and acclimated Bourbon Cotton seeds sown 15th August and 15th September, have been complete failures, not a seed having vegetated. The New Orleans $\frac{N.O}{B}$ and $\frac{N.O}{R}$ have come up, and are in healthy condition.

Of the American maize seeds, the prolific and white flint corns turned out very fine crops; one head of the latter contained 620 grains, and weighed without the husk 25½ rupees. The sugar-cane, white and yellow gourd and tuscorora likewise turned out well, but far inferior to the two first mentioned kinds. A considerable quantity of these seeds have been distributed throughout the district, through the kind medium of Messrs. Mills, Cardew, Brownlow, Gilmore and Trevor.

All the cabbage seed failed, but I was prepared for disappointment here, as you mentioned in your letter you could not speak for the soundness of the Cape seed you sent me, (being the remnant of last year's stock.)

The Bilsa, Cuba, and Gibali tobacco seeds are very fresh, and I expect a fine crop. Colonel Garnault has presented the Society with some Persian seed, which I expect will produce tobacco of a superior flavour.

The Tennevelly senna is now above ground, but the seed did not vegetate freely.

I have as yet only tried the munjeet in a gumlah, but none of the seed sown has vegetated, and I fear the soil of the garden here will not answer for its cultivation, however it shall have a fair trial.

From England and the Island of Vido in the Mediterranean, I have lately procured some fuchsia fulgens, potentilla, callomea coccinea, iris, and pelargonium seeds, which have been sown in gumlahs, and are mostly doing well.

I believe the Parent Society presents fifty rupees and two silver Medals to its Branch Societies: if so, I should feel greatly obliged if you would kindly take the trouble to get them for this Society.

I am, &c.

W. W. DUNLOP,

Cuttack, 25th Sept. 1844. *Secretary, Cuttack Branch Society.*

Observations upon the Corn Weevil, contained in a Letter addressed to the Rev. F. W. Hope, *F.R.S., Pres. E.S., &c.* *By* William Mills, *Esq., F.L.S., &c.*

I spent from the month of January till August this year (1835) in Madeira with my friend Lord Vernon, with whom I went out in his yacht, the *Harlequin*, and I had an opportunity of observing a good deal upon the Weevil, (*Calandra granaria*). What the progress of the annual laying of the egg in common wheat is, I am not quite prepared to say, as Shaw declares that the female perforates a grain of wheat and lays its eggs; but I am inclined to differ with him in that; and in regard to Indian corn, I am pretty certain that the animal lays its egg in the blossom, and that the corn is formed with the egg in the heart. I examined very many grains for several days, and most minutely, with a microscope, and could discover no signs of perforation anywhere, although the chrysalis was evidently there in the centre of the grain. I then cut the grain open, took the chrysalis out, but could discover no wound of any nature in the corn itself by which it could have been lodged from without: this happened so continually, that it leads me to suppose that it must have been deposited during blossom. I then tried at what heat I could hatch them, and I found 110° Fahrenheit succeeded, whilst from 130° to 140° of heat kills them. A gentleman of the name of Wilkinson, in Maderia, has now established a heated room with hot water pipes, in which he receives as many as 800 bags of wheat at a time; these become heated through at about 135°, and the wheat, when resifted, is perfectly cleansed from these noxious insects, and makes quite as good bread as before. I also tried some of it in the ground that had been subjected to this heat, and it came up. It is very possible I may not have communicated anything very new to you, but which, if such be the case, I am sure you will excuse. An old medical gentleman assured me that he considered the wings and crustaceous parts of the Weevils so heating to the system, as to be almost as injurious as cantharides taken internally on a slow scale. And when we consider the quantity of bread which is imbuded with them in warm climates, it is decidedly worth attending to for the sake of a purer food. I am aware that weevils, when once brought amongst corn, continue to breed by laying the egg in wheat. But how do they first get there at all? Nature has supplied them with wings, so that the reaching of the blossom for the purpose of laying the egg is perfectly attainable to them. In almost all the instances I have alluded to, the insect was

in the heart, and the *farina* formed all round it without a wound of any nature. Amongst rice and other grain I believe them to be communicated entirely in store, or in a ship, which amounts to the same thing.—*Transactions of the Entomological Society.*

Of fertilizing the Soil by means of Manures.

The great object for which farming *ought* to be pursued, whether in pastoral or arable districts, is increase to the fertility of the soil. The object, however, commonly kept in view in cultivating the soil, is constantly to derive the largest amount of produce from it. Though these two ends are diametrically opposed, as regards the condition of the soil, enlarged crops cannot be obtained but from increased fertility. Strange to say, that this truth seems only to have been discovered lately, and it is its adoption now as a rule of practice that constitutes the great difference between the agriculture of the present day, and that of former years. Not many years ago, cultivators were so irrational as to believe that they might continue to reap bulky and weighty vegetable crops from the soil, without having to return to it an equal weight of vegetable matter. Their practice implied the belief, that a virtue naturally exists in the soil, which enables it to yield crops out of its abundance; and the belief certainly receives support from the fact of soils of natural fertility yielding largely with very inadequate culture; and such a belief is naturally clung to with great tenacity by farmers who cannot conceal from themselves the mortifying fact, that the ordinary resources of ordinary farms are unable to afford a return of as much matter in support of the soil, as the weight of the crop obtained from it. To make up for the deficiency, many expedients are resorted to,—such as bare-fallows, changes of rotation, lime, and at length draining, which are all tried in succession and in co-operation, in order to sustain the soil in good heart; but useful as all these auxiliaries are, they are found to be no substitutes for the one indispensable source of fertility—*farm-yard manure.* It is admitted, on all hands, that without this manure, or some equivalent, if such there be, it is impossible for the soil to continue, for a series of years, to yield abundant crops; and it should also be admitted, that where the soil is not manured to the degree to call forth its *best* energies, a large amount, both of time and produce, is lost by a state of cultivation which is inefficient.

It was, and still is, a very natural desire in the farmer to be able to conduct his farm upon its own resources. True, he carries off to market a great weight of its produce every year; but it is equally true that

the farm is, as it were, a field of creation,—where is raised every year what never existed elsewhere before. There is no unreasonableness in the supposition, at first, that the application of all the disposable manure of the farm, together with skilful culture, might sustain, or even increase the fertility of a portion of its soil. It is easy to suppose, that, in addition to manure, skilful culture on exposing the soil to the atmosphere, by the action of the plough, the harrow, and the roller, may tend to increase its fertility by pulverisation; because observation affirms, that where the *natural* productions of the soil are most luxuriant, the soil is deep, and in a pulverised state. It is easy to conceive, when the soil is thus exposed by mechanical means, that a mutual chemical reaction takes effect between its constituents and the component parts of the air; and that the influence of rain, and heat, and light, may so alter the tone of the soil, imparted by the last crop, as to render it better for a succeeding one. It is easy to imagine, that, when superfluous water on land in winter is provided with channels, through which to flow away easily, and not remain to consolidate, refrigerate, and acidify the soil, that the soil will become warmer, more easily pulverised, and more congenial to vegetation. With all these means of melioration, and with experienced skill, conjoined with the enriching quality of every animal and vegetable manure available, together with such a rotation of cropping as to render those means effective to the greatest degree; it is, I say, very natural in farmers to expect the soil, in such circumstances, to yield an increased produce. Yet, after all, melancholy experience has shewn the unreasonableness of the expectation, and has proved, beyond doubt, that no farm is able to *sustain* the fertility of its soil by its own resources, far less to *increase* it. The disclosure is useful, because, though disheartening, it has not dissuaded the farmer going in quest of assistance, nor has a knowledge of his wants deterred others presenting to his notice an almost innumerable host of succedanea. The difficulty with him now is, in choosing from among these what is really a useful manure.

Before directing our attention to any of the substitutes for farm-yard dung, which are now-a-days so rife, let us consider, in the first place, the extent of the resources which a farm of mixed husbandry possesses in supplying itself with manure; and to forming a just estimate of this inquiry, I regret to say, little information is to be found on which much reliance can be placed. It is a species of information, however, worthy of being ascertained by experiment on every class of soil, and in every system of husbandry.

Resources of the Farm.—The entire resources of a farm consists of the straw of the grain crops, all the green crops, whether of forage, tubers, or bulbs, all the grass and hay, all the dung of animals, whether confined in the steading, or at large in the fields, all the weeds picked off the fields, and every other refuse, such as coarse grasses, scourings of ditches, &c. Now, on looking at (1970.), it will be found from data adduced there, that a return of 1 ton of straw per imperial acre, at an average, from all the crops usually cultivated, is above the mark for Scotland. The English authorities, Arthur Young and Mr. Middleton, estimated the average at from 1 ton 7 cwt. to 1 ton 5 cwt. per imperial acre. The late Dr. Coventry estimated the average for Scotland at 1 ton 1 cwt. Judging from the produce in the neighbourhood of Edinburgh, I should say that 1 ton per acre was quite high enough an estimate for Scotland. Taking 1 ton as the average, the question is, what quantity of muck will this afford? and in considering this question you should remember, that, in the system of husbandry adopted for illustration, 200 acres are every year in corn, 200 acres in grass, and 100 acres in fallow. So that the whole dry straw of a farm of 500 acres would only weigh 200 tons. Dr. Coventry estimates it as probable, that straw, after it has been wetted by the dung and urine of animals in courts and stables, and by the rain that may have fallen upon it, will weigh four times more than in the dry state; but that wet litter is reduced $\frac{1}{3}$ of its weight by fermentation before it is applied to the soil in the shape of manure. The other $\frac{2}{3}$, together with the pulse crops, as pease and beans, and the refuse of the corn crops, such as chaff, &c., he supposes may supply 4 tons of manure from every acre of straw, or 800 tons in all. Supposing the hay crop to weigh $1\frac{1}{2}$ ton per acre, and treated in the same manner as fodder-straw, will afford 6 tons per acre of manure, which over 20 acres of hay, will afford 120 tons of manure. The moist part of the turnip crop may be considered as computed in the additional weight acquired by the dry straw, after the turnips have been used by the live-stock in the courts and stables, still the firm portion of the crop will yield a great return, and besides improve the quality of the entire bulk of manure. Supposing that 24 tons is a fair crop of turnips per acre, and that $\frac{1}{4}$ of this is available for manure, 6 tons per acre will be derived from this source, as assumed by Dr. Coventry, and if there are 69 acres of turnips, the dunghill will be increased in weight, if not in bulk, by this means, to the extent of 414 tons.* These are the chief resources of available manure on the

* Coventry's Notes on the Culture and Cropping of Arable Land, p. 24.

farm, and they afford an aggregate of 1334 tons, which at 15 cwt. per cart-load, gives about 1778 loads of dung. Of these, the potatoes require 20 loads per acre (2411.), 15 acres = 300 loads. The 69 acres of turnips, according to the dunging specified in (2500.), would be divided into 30 acres of Swedes, at 20 loads per acre = 600 loads; 10 acres of yellow, at 16 loads = 160 loads; and 29 acres of white, at 13 loads = 377 loads, in all for green crop 1437 loads; and as 10 acres of bare fallow and 6 acres of tares have to be dunged, which at the least will require 16 loads per acre, 256 loads will be required for this purpose (2824.). This calculation leaves 85 loads over after dunging the fallow division to an ordinary degree.

I suspect that the quantity of manure derived from the farm, as I have just stated it, and which is founded on the data furnished by Dr. Coventry, gives too favourable a view of the farm, and is not in conformity with the experience of most farmers. I remember when in Berwickshire, on a farm of near 700 acres of land of good stamina for corn, no manure was ever bought for it. It was farmed on the 5-course shift, the fallow-break comprehending 130 acres, and about 90 stacks of 15 feet diameter used to be built within and without the stackyard in a good season. Though the turnips, occupying about 80 acres, were well dunged, keeping in view that a part were to be eaten off by sheep, I must own that the bare-fallow-break, consisting commonly of 40 acres, the remaining 10 being in potatoes and tares, were but lightly manured; and, no doubt, had manure been as plenty as is represented above, the bare-fallow land would have received more than it did. To sustain the stamina of the land, what was bare-fallowed in one course was made to bear turnips in the next. I may mention, in explanation of the circumstances I have stated regarding this farm, that it was situate 10 miles from the market town, and neither bone-dust, nor any such manure, was in vogue in those days. With the facilities now existing for obtaining manure, farmers may conduct their rotations with comparative ease, and as they please. On a 300 acre farm of turnip-land in Forfarshire under a 5-course shift, which I referred to in the rotation of cropping light lands, I could not, for the first few years, manure from its own resources more than 30 acres of the fallow-break of 60 acres; and even after 8 years of improving culture, the quantity never exceeded 40 acres, the remaining 20 acres being dunged with extraneous manure, partly with bone-dust and partly with cows'-dung purchased at 5s. per ton, or 7s. the double-horse load. So great is the diversity of results obtained by farmers in regard to the proportion which the straw really bears to the crop, that little reliance, I fear, can

be placed on Dr. Coventry's estimate, as one for general application, even though we should be made acquainted with the premises from which he drew his conclusions. A limited experiment *would afford no* satisfactory results on this subject. By way of *illustration, I may just* mention the result of some experiments which were tried by Colonel Le Couteur with 4 different sorts of wheat with a view to ascertaining the quantity of straw afforded by each, and he obtained these very different results under the same circumstances; viz:—

	Bu.		lb.		Straw.		
The White Downy, yielded	48	and	4557	of straw	= 95 lb.	per bushel.	
.... Jersey Danzig, ...	43½	....	4681	....	= 107	....	....
.... Whittington, ...	33	....	7786	....	= 236	....	....
.... Belle Vue Talavera,	52	....	5480	....	= 105½	....	....*

The quantity of straw to the bushel in the Jersey Danzig and Belle Vue Talavera is nearly the same, though the gross amount of produce, which is the source of manure, is very much in favour of the latter; while with the other two varieties of wheat, the quantities are very dissimilar and disproportioned, both of grain and straw; and on taking the gross weight both of grain and straw, the diversities and disproportions are just as great, thus:—

	lb.		lb.				
Of White Downy, the grain weighs	2976,	the straw	4557 =	little more than		½	times.
.... Jersey Danzig, ...	2740,	....	4681 =	....	....	⅔	..
.... Whittington, ...	2013,	....	7786 =	....	....	3⅚	..
.... Belle Vue Talavera, ..	3172,	....	5480 =	....	....	1½	..

It is clear, therefore, that any results on this subject that should command general credence are yet to be derived from experiments conducted on a large scale throughout the country.

Farm-yard dung.—The acknowledged universal applicability of farm-yard dung to every other article of the kind, may arise from its very complex composition affording nourishment to every kind of plant raised on the farm. It is a compound of straw of various kinds of horse-dung, cattle-dung, pigs'-dung, of the urine of those animals, of whatever dung the poultry may have dropped in their peregrinations through the different court-yards, and of rain-water, but of the sorts of dung, much the largest proportion consists of that of cattle. Analyses, I believe, have been made of farm-yard dung, in the state it is applied to the land, but as portions vary in composition, according to the

* Journal of the Royal Agricultural Society of England, vol. 1, p. 123.

proportion of the different sorts of dung and urine it contains, it will be more satisfactory to give the analysis of each component part, than of the whole together, though it is the aggregate which plays the important part in the economy of a dunghill. Of the various constituents of straw you have already been made acquainted, in (1965.) and (1966.)

The composition of cattle and horses' dung and urine is as follows:—

COWS' DUNG.

	Hailden.
Phosphate of lime,	10.9
——— magnesia,	10.0
Perphosphate of iron,	8.5
Lime,	1.5
Gypsu	3.1
Chloride of potassium, } ——— copper, }	trace
Silica,	63.7
Loss,	1.3
	100.0

COWS' URINE.

	Brande.
Chloride of potassium and sal-ammonia,	15.
Sulphate of potash,	6.
Carbonate of potash,	4.
——— lime,	3.
Urea,	4.
Water,	650.
	682.

HORSES' DUNG.

	Jackson.
Phosphate of lime,	5.00
Carbonate of lime,	18.75
Phosphate of magnesia,	36.25
Silica,	40.00
	100.00

HORSES' URINE.

	Vauquelin.
Carbonate of lime,	11.
——— soda,	9.
Hippurate of soda,	24.
Chloride of potassium,	9.
Urea,	7.
Water,	940.
	1000.

I am not aware of any analysis of pigs'-dung, but Spreugel examined pig's urine, when the animal was fed on corn offal, and found it to consist of—

Water,	92,600 in	100,000 parts
Urea, with very little mucus, albumen, and colouring matter,	5,640	
Salts, as common salts, muriate of potash, gypsum, carbonate of lime, and sulphate of soda.	1,760	
	100,000*	

Of the origin of all these substances in the urine and dung of animals, and of the use of them as a manure to the soil, Liebig thus expresses himself in his own peculiar manner: "It has been shewn," he says, "by

* Journal of the Royal Agricultural Society of England, vol. 1, p. 492.

an examination of fæces and of urine, that the mineral ingredients of the food—the alkalis, salts and silica—are eliminated in these excrements. Urine contains all the soluble mineral substances of the food, while the fæces contain the ingredients insoluble in water. As the food is burned in the body just as it would be in a fire-place, the urine may be said to contain the soluble salts of the ashes, and the fæces the insoluble salts. These analyses shew, as nearly as can be expected from experiments of this kind, that all the constituents of the ashes of the food are again obtained, without alteration, in the solid and liquid excrements of the horse and cow. The action produced upon our fields by the liquid and solid excrements of animals ceases to be mysterious or enigmatical, as soon as we have attained a knowledge of their mode of origin."* Here, then, a mutual reproduction goes on between the food and the dung of animals; whatever ingredients animals consume in their food, those only they can and do void by their dung and urine, and these again constitute the best manure for raising the food upon which the animals feed. It follows that the ingredients afforded by straw, hay, turnips, and potatoes, are voided as dung and urine by the animals which feed upon them, and that the dung derived from them makes the best manure for raising the same crops. It follows also, that the farm itself is the best source of the manure that should be applied upon it. Also, that could the whole food consumed on the farm be returned again to the soil, in the shape of dung and urine, it will continue to yield without diminution; but this is impracticable, because the animals which are fed, take away, in increased size of body, and the animals wrought, in muscular energy, much of the ingredients of the food they consume, so that the soil must be supplied with manure from other sources to be able to sustain its fertility, and much more so to increase it. This conclusion, which reasoning may have arrived at, is that derived from experience.

Assuming this to be the best general theory that can be given of the source of manure for a farm, we may make the same remark which Professor Johnston does, when speaking of the particular crops of a rotation: "It may be said that this explanation seems to imply that the same kind of crop may be reaped from the same soil for an indefinite number of years, by simply adding to it what the crop carries off. This is certainly implied in the principle; and *if we knew exactly what to add for each crop*, we might possibly attain this result, except in cases where the soil undergoes some gradual chemical alteration within itself,

* Liebig's Chemistry, in its application to Agriculture and Physiology, p. 176. Edition of 1843.

which it may require a change of treatment to counteract."* In connection with this view of the subject, practice appropriates the several sorts of dung in a determinate way. For example, horse-dung is preferred for potatoes, cow-dung for turnips, and care is taken not to apply pig-dung to potatoes, as it will inevitably impart a strong disagreeable taste to them.

Farm-yard dung is always applied in Scotland to the soil when it is under the operation of the plough, that is, it is always buried *under* a portion of the soil; and the object of this treatment is to secure all its volatile ingredients, as well as its more solid constituents. In England, however, it is extensively employed in top-dressing old meadow-land, which is made to produce hay every year; and, no doubt, if well fermented, and applied in moist weather, the soil will derive much benefit from it, and some such application is necessary, when the entire produce of the grass is carried off, as is the case with the hay crop. But it cannot admit of doubt that this practice occasions much waste of manure; very much of its volatile part must be dissipated, and much of its solid part dried by wind and heat. The practice is indicative of bad farming for two reasons which ought to be conclusive with a good farmer. The first, as I have already stated, is the waste, to whatever extent, of valuable manure which it occasions; and the other reason is, that as old meadow-land is not included in the rotation of the rest of the farm, the manure it receives is so far a robbery of the arable farm, while it may return no manure at all, as all the hay may be sold and carried off. The rotation usually followed in England, in conjunction with old meadow-land, is, as I have already mentioned in the preceding section, the 4-course shift, a course which it is impossible to uphold on any farm without the assistance of extraneous manure. It is evident, therefore, that top-dressing old meadow-land with farm-yard dung from another portion of the farm which is in a different course of management, is a scourging system for any arable land, and is, on that account, bad farming.

Farm-yard dung is also used in conjunction with other manures. Bones and guano are used along with it in the raising of turnips; and I am satisfied this is the best way of raising turnips, whether they are to be partly eaten off with sheep, or entirely carried away, and, at the same time, of maintaining the *stamina* of the soil, that is, its power of endurance under any system of cropping.

The durability of farm-yard dung is its great recommendation as a manure. Doubtless it is applied in large quantities, not less than from

* Johnston's Lectures on Agricultural Chemistry and Geology, p. 719.

10 to 20 tons per imperial acre, but a great proportion of this weight consists of water, even of well fermented dung; and were it practicable, or even proper to evaporate this, and thereby greatly reduce the weight, I am doubtful that the efficacy of the manure thereby would be impaired. I am persuaded that the first evaporation from a dunghill under fermentation consists entirely of water, and that not only a strong fermentation, but one conducted in an advanced part of the season, say not before April, is required before the constituents of a dunghill are begun to be dissipated. It is only after a *strong* smell is emitted, that a decomposition of parts is accomplished; for as to ammoniacal vapours flying off, ammonia has too strong affinity for water to leave the dunghill before it becomes dry enough.* For there is much virtue in the *sap* of dung, as the experience of every dry season confirms; and it is very difficult to evaporate the entire sap from a well-mixed dunghill, as the state of such dung shews even after fermentation has ceased in it.

Dung is applied at the commencement of every rotation of crops with the fallow green-crops, and with bare fallow; and when applied at any other time, it is near the termination of a long rotation. A rule for the quantity of farm-yard dung to be applied according to the length of the rotation, as given by Dr. Coventry is, that 5 tons per acre are required every year to sustain the fertility of soil; and therefore land which is dunged every 4 years in a rotation of 4-courses, should receive with the fallow-crop 20 tons per acre; in a 5-course shift, 25 tons; in a 6-course shift, 30 tons, and so on.† These quantities constitute, no doubt, a sufficient manuring to ordinary crops; but it appears to me to be reversing the order of propriety, to give land under the severest shift—a 4-course one—the smallest modicum of manure, when it should receive the largest; for there is surely truth in the observation, that land grazed with stock becomes ameliorated in condition—actually increased in fertility. A 6-course shift, therefore, having 3 years of grazing, should require less instead of more manure even at a time than a 4-course one on land of similar quality.

Human fæces.—The food of man being of the richest and most varied description, human fæces and urine should contain valuable and numerous ingredients as manure; and if the principle be sound, which Liebig maintains, that animals fed on a certain kind of food void excrements best suited as manures for raising that food, then the food of

* Professor Henslow's suggested experiments in Suffolk, may in time clear up this subject.

† Coventry's Notes on the Culture and Cropping of Arable Land, p. 4.

man should best be raised from his own excrements manuring the soil. The analysis of Berzelius of human urine and fæces gives the following constituents in 1000 parts:—

HUMAN URINE.	
Urea,	30.10
Free lactic acid, lactate of ammonia, and animal matters not separable from them,	17.14
Uric acid,	1.00
Mucus of the bladder,	0.32
Sulphate of potash,	3.71
——— soda,	3.16
Phosphate of soda,	2.94
——— ammonia,	1.65
Chloride of sodium,	4.45
Muriate of ammonia,	1.50
Phosphate of magnesia and lime,	1.00
Silica,	0.03
Water,	933.00
	1000.00

HUMAN FÆCES.	
Phosphate of lime, ——— magnesia, Traces of gypsum,	100
Sulphate of soda, ——— potash, Phosphate of soda,	8
Carbonate of soda,	8
Silica,	16
Carbonaceous residue and loss,	16
	150

In regard to what man returns to the soil from which he extracts his own nourishment, it is thus represented by Liebig:—"The importation of urine or of solid excrements from a foreign land is quite equivalent to the importation of corn and cattle. All these matters, in a certain time, assume the form of corn, flesh, and bones; they pass into the bodies of men, and again assume the same form they originally possessed. The only true loss that we experience, and that we cannot prevent on account of the habit of our times, is the loss of the phosphates, which man carries in his bones to the grave. The enormous quantity of food which man consumes during the 60 years of his life, and every constituent of it that was derived from our fields, may again be obtained and restored to them. It is quite certain that it is only in the bodies of our youth, and in those of growing animals, that a certain quantity of phosphate of lime is retained in the bones, and of alkaline phosphates in the blood. With the exception of this extremely small proportion, in comparison with the actual quantity existing in the food, all the salts with alkaline bases, and all the phosphates of lime and magnesia which animals daily consume in their food—in fact, therefore, all the inorganic ingredients of the food—are again obtained in the solid and liquid excrements."*

* Liebig's Chemistry, in its application to Agriculture and Physiology, p. 178—18. Edition of 1843.

Human fæces constitutes a most efficient manure in the raising of turnips, but its tenacity renders it very difficult of application to the soil; and this is the case, whether it be commixed with a common dunghill, or with earth, chaff, or saw-dust, because none of these substances unite with it readily. It may be mixed with any of these ingredients, or applied alone, and if so, sparingly. As to the offensiveness of its odour, which many work-people stickle at, it may be overcome, by sprinkling occasionally over it, when being removed, a solution of the chloride of lime. This solution may be purchased in quart bottles at only 1*s.* each, and it should be diluted with 14 times its bulk of water when used. There is great waste of this valuable manure near dwelling-houses and farm-steadings; and though necessaries were erected, they would remain neglected.

Humen fæces is mixed with other ingredients, and sold under various denominations, such as poudrette, animalized carbon, desiccated compost, and the like. When such a composition is honestly formed, it cannot fail to make a powerful manure; but the farmer has no security against adulterations, and it is well known he is plundered at all hands by the imposition upon him of useless compounds. For my own part, I can say that when the animalized carbon first came to this country, about 20 years ago, it raised turnips as well and as cheaply as bone-dust; but it soon fell far short of its first exertions, though it rose in price as it fell in value. So with desiccated compost; I have tried it in comparison with farm-yard dung, pigeons' dung, and rich vegetable mould, and so far was it from being a manure at all, that even the black mould taken from the bottom of an old stone-dyke raised better turnips. Indeed, it scarcely afforded a better result than some drills which were not dunged at all, but were sown with turnips, by way of contrast and as a standard of comparison. I am sure many farmers have been grievously deceived in the purchase of manures, and this being the case, every *compound* he wishes to try, he should mix for himself at home with the genuine ingredients of which it should consist. Such a precaution is necessary, for to be deceived in the particular of manure, is, in effect, to incur the loss of a whole year's crop, and such a loss involves not merely individual, but national interests.

Bone-dust.—The composition of this substance, which is of so much worth to the farmer, I have already given (in 2529.), and, on account of its containing so great a variety of constituents, it is a true and valuable manure. It is now believed that the phosphate of lime, with which they most abound, is the most valuable ingredient in the manure of bones. Bone-dust exhibits, however, a peculiarity in its effects, as a manure, which seems inexplicable, namely, that a given quantity

produces a maximum effect. Thus, I have tried 12, 16, 20, and 24 bushels per acre with white globe turnips, and found the crop to improve with 12 to 16 bushels; but what is remarkable, neither the 20 nor the 24 bushels gave a greater crop than the 16. This, no doubt, may be explained from the probability of the turnip requiring only a certain quantity of nourishment, which the 16 bushels supplied, and this may account for the amount of the turnip crop received; but it cannot account for the insensible effects upon the succeeding crops, for neither the barley, the grass, nor the oats which followed the turnips in the rotation, were in the least more increased in bulk and quantity with the 20 and 24 bushels than with the 16, though the 16 yielded better than the 12. We cannot conceive that the soil received no greater benefit, as regards condition, from 24 than from 16 bushels, yet the crops indicated no difference whatever. It is true I did not measure and weigh every bushel and ton of the produce, but I had the same means of judging them all,—namely, by minute inspection. I knew that the respective quantities of manure and seed were applied during the entire rotation on every similar soil in quality and situation, in the same field, and on the same day. Nor were these comparative experiments conducted on a very small scale, such as $\frac{1}{8}$ of an acre; for each portion comprehended 4 long ridges of 15 feet in width, containing not less than $1\frac{1}{2}$ acre. There were other results brought out by this experiment. The turnips were all carried off the ground, that is, none were eaten off with sheep, as the $\frac{1}{2}$ should have been, and in so far the clearing of the field after bone-dust was an act of bad farming; but the robbery was committed from necessity, as there was a deficiency that season of dunged turnips for the cattle, whilst the turnips raised by bones were more extensive than the sheep I had could overtake. Though an act of bad farming, the experiment proved two important particulars; *first*, that bone-dust of itself benefits the whole crops of a rotation; the barley, grass, and oats, that followed the turnips, were all good; and, *second*, they were equally good, turnips, included, with similar crops raised in the same field, and on the same soil, with 16 tons of well-made farm-yard dung. Indeed the grass was in quality much finer. So we may conclude, that 1 bushel of good bone-dust is equal in effect upon crops, during a 5-course rotation, to 1 ton of farm-yard dung. It does not follow, however, from this result, that that small quantity of bone-dust will sustain the enduring fertility of soil for many years like dung.

Perhaps there is no way of applying bone-dust so efficaciously—and certainly there is none in my estimation—as upon farm-yard dung. Drill the land for turnips, say with 12 cart-loads of dung, and then sow

the seed with 8 or 10 bushels of bone-dust. The bone-dust secures the early progress of the plant, and the dung sustains it after the roots strike into it. Such turnips eaten off with sheep, should put and keep any land in good heart. With 8 bushels of bones, and finely riddled coal-ashes at pleasure, an excellent crop of turnips may be raised for sheep.*

Guano.—This is a foreign substance, which has only recently been introduced into the country as a manure. It is just the dung of birds, and is perhaps no better manure that that of our own sea-birds would be, could it be preserved; but no sooner is it voided, than the rain and snow, and waves of the ocean, wash it away; whereas, in the tropics, whether in America or Africa, the heat desiccates and preserves it immediately on being voided. It is a compound containing many ingredients, as may be seen from the following analyses:—

	By Bartels.	By Völckel.
Muriate of ammonia, ...	6.500	4.2
Oxalate of ammonia, ...	13.351	10.6
Urate of ammonia, ...	3.244	9.0
Phosphate of ammonia.	6.250	6.0
Waxy substance, ...	0.600	...
Sulphate of potash, ...	4.227	5.5
———— soda, ...	1.119	3.8
Phosphate of soda, ...	5.291	...
———— magnesia and ammonia,...	4.196	2.6
Chloride of sodium,......	0.100	...
Posphate of lime, ...	9.940	11.3
Oxalate of lime, ...	16.360	7.0
Alumina, ...	0.104	...
Residue insoluble in nitric acid, ...	5.800	4.7
Loss, consisting of water, ammonia, and organic matter, not estimated, ...	22.718	32.3

In the short time since the introduction of guano, it has proved itself a true and valuable manure. When tried on turnips against farm-yard dung, at the rate of only 3 cwt. per acre, it produced 20 cwt. 6 stones, on a similar piece of ground, that 18 cubic yards of dung per acre produced 19 cwt. 2 stones. Tested against bone-dust, at the rate of 16 bushels, and coal-ashes 8 bushels, together 24 bushels per acre which produced 19 cwt. 2 stones, guano, at the rate of 3 cwt. per acre, yielded

* Liebgig's Chemistry, in its application to Agriculture and Physiology, p. 181. Edition of 1843.

23 cwt. 2 stones. Against bone-dust alone, at the rate of 16 bushels per acre, which produced 24 cwt. 7 stones, guano, at the rate of 2 cwt. produced 31 cwt. 4 stones.* Guano is very efficacious for turnips, along with a little farm-yard dung. Its fame as a manure is now established, though as a substance which would make a good manure, it was known and examined by Sir Humphry Davy more than 40 years ago. Such is the demand for it, that its price is about 10*l.* per ton, and it reached, in the summer of 1844, to 14*l.* The value of bone-dust, in consequence, has fallen to 1*s.* 9*d.* per bushel. In the use of guano precaution is requisite, as it is apt to effect the vitality of seeds sown in contact with it, so that a little earth between it and the seed is necessary.

Pigeons' dung.—This manure, I have no doubt, would be as valuable as guano, could it be obtained in sufficient quantity. I have tried to raise turnips with it, and succeeded to admiration; and one season, 1823, I raised Swedish turnips with 4 double cart-loads. The quantity was applied in the drill with a shovel by guess, but having the desire to make it go as far as possible, I suspected that I had stinted the land of manure. The seed was afterwards sown upon the drill, which buried the dung, and the crop throughout the season was very superior to that from farm-yard dung or bone-dust. The bulbs proved large, and a heavy crop; but I had not leisure at the time to attend to particulars. Next season the dove-cot only yielded 1 double load of dung, but so far as it went, I was equally successful in raising Swedish turnips. Tanners, I believe, will give a high price for pigeons' dung, as I have been offered 16*s.* per ton for it; but I would advise you rather to use it at home for Swedish turnips. I have seen it stated somewhere, that 50 bushels of pigeons' dung; or 40 bushels of pigeons' dung with 8 bushels of rape-dust; or from 12 to 15 bushels of pigeons' dung, with 12 to 15 bushels of bone-dust, are sufficient to raise turnips equal to a good dunging of farm-yard manure. My opinion is, that pigeons' dung is as efficacious as guano, or at least as bone-dust, and that, therefore, those quantities of pigeons' dung are much too great per acre imperial. When pigeons' dung is wetted with water, it ferments rapidly, and in a few days may be riddled and mixed with equal quantities of ashes, and sown for turnips, at 32 bushels per acre. When this mixture is spread in January or February, out of carts, as a top-dressing on new grass, it is said to make it fit for cutting 14 days earlier than the

* Transactions of the Highland and Agricultural Society, for October 1843. p. 70-2.

ordinary time. Whether these statements are strictly correct, I cannot say from my own experience, but they are worth testing by experiment.

Pigeons' dung has been chemically examined. "The excrements of pigeons," say Sprengel, "have been chemically examined by Sir Humphry Davy and myself. Davy found in 100 parts by weight 23 parts of substances soluble in water, consisting of urea, urate of ammonia, common salt, and some others. According to my own experiments, pigeons' dung half a year old, contained only 16 per cent. of bodies soluble in water, consisting of very little urea, but of a large proportion of carbonate, sulphate, and muriate of ammonia, common salt, and sulphate of potash. The other 84 parts insoluble in water consisted of coarse siliceous sand, silica, phosphates of lime and magnesia, traces of alumina, and oxides, of manganese and iron. The abundance of soluble substances explains the quick effect of pigeons' dung, and also shews us once more the great value of mineral manure."* Hence the propriety of applying pigeons' dung fresh, or of strewing the floor of the dove-cot with soil abundant in humus, for the ammonia of the dung to combine with the humic acid of the earth.

Fish garbage.—In fishing villages, where fish are smoked or salted, a considerable quantity of fish refuse may be obtained, and it constitutes an efficient manure for every kind of crop. On the east coast of Scotland, 30 barrels of fish-heads and guts, half of cod and half of haddock, are enough of manure for 1 acre. The barrel contains 30 gallons, and 4 make a cart load. The refuse sells at 1s. 6*d.* per barrel, and so does liver and oil refuse. In preparing fish refuse for manure, it is emptied from the barrels on a head-ridge of the field to be manured, and mixed with a quantity of earth sufficient to cover the refuse completely. It is driven fresh to the field whenever a supply can be obtained from the fishers. In 2 or 3 months the compost is ready for use; and as a manure for turnips is superior to farm-yard dung, and equally beneficial on light and heavy soils. When used for turnips, the compost is spread with shovels out of the cart along the drills, at the rate mentioned; over which the drills are split, and the seed sown along the drills by the machine. Of course, it may be applied to bare fallow for wheat, as well as for green crops. It is sometimes laid on as a top-dressing in autumn upon lea, and ploughed in; and, as may be expected, the succeeding oats prove an excellent crop. Swedish turnips are afterwards taken with the ordinary manuring of farm-yard dung; and in

* Journal of the Royal Agricultural Society of England, vol. i. p. 493.

the circumstances, they never fail to yield abundantly, while the soil is put into the finest condition. From 400 to 600 barrels of this refuse are obtained by a farmer during the season; but those whose farms are nearest the villages have the best chance, unless a special agreement be made with the fishers. Fish refuse may, therefore, be regarded as a true manure (See 2401. 11.) In regard to sprats, as a manure, Mr. Cuthbert Johnson relates, that "the farmers of Essex and Suffolk purchase these fish by thousands of bushels at a time, and carry them in waggons 10 or 15 miles into the inland districts. The quantity applied per acre varies from 25 to 45 bushels, the poor gravelly soils requiring more than the loamy lands. They are spread by hand from seed-baskets, and on winter fallows intended for oats, on which, especially if the summer is not too dry, it produces most luxuriant crops, of a peculiar dark green colour, yielding 10 or 11 quarters per acre, and that on land of a very second-rate description. The effect of the application, however, remains only for 1 crop. They produce an equally good result, if mixed with earth, and suffered to remain and dissolve for some time in the heap, before they are carted on the land. In this way they answer exceedingly well for turnips. They are usually obtainable at the rate of 6*d.* or 8*d.* per bushel."* The refuse of pilchards and of herrings are, of course, of equal value to those mentioned, where they are obtainable.

Sea-ware.—To farmers situate on the sea-coast, this manure is a valuable acquisition, so much so, that, on the east coast of Fife, I have heard it stated that as much as 10*s*, per acre are offered for farms that command a large supply of sea-ware more than for others not so fortunately situate. On many of the farms in East Lothian, from 100 to 120 imperial acres are annually manured with sea-ware; and when I mention that 30 double-cart loads are spread on 1 acre, you may conceive the labour incurred in carting from 3000 to 3600 loads during a short season; for it is only in winter that the ware is cast ashore by storms, when the plants have arrived at maturity, and are more easily detached from the rock by a heavy sea. The collecting and driving are calculated in Fife to cost from 1*s.* to 1*s.* 2*d.* per cart-load. Sometimes when a bank of sea-ware has been driven on shore, and there is risk of its being washed away again by the waves, all hands are employed, men, women, and horses, to land as much as they can above high-water mark, as long as the danger of losing it exists. In Fife, 16 loads per acre of ware are supposed equal to 20 loads of farm-yard dung, but this seems

* Johnson on Fertilizers, p. 114.

an exaggeration. There is no doubt; however, that it makes an excellent top-dressing for the aftermath of a crop of hay. It is likewise spread on lea, and affords the means of yielding a fine crop of oats. It is also ploughed in with the oat-stubble, in preparation of the land for turnips. In all cases it is ploughed in as fresh a state as possible; and to assist the plough in burying the long leaves and tangles, a field-worker follows the plough, and rakes the ends of the ware into the furrow with a small dung-spreading graip. The composition of sea-ware, and a few remarks on its natural history, will be found in (2041-2-3,).

Cow's urine and dung are obtained by farmers from the cowfeeders in town, on payment of 5s. per cow for the year, and the expense of driving, when the cows are in the byre, and not in fields in summer; or, if paid for in kind, instead of money, ½ kemple of 16 stones, of 22lb. to the stone, per annum for each cow. Cow-dung is sold at 5s. per ton, or L 4 15s. per cow per annum. The market gardeners in the neighbourhood of Edinburgh manure their garden ground with cow-urine, to the extent of 40 tons per imperial acre. This quantity, though raising large crops of vegetables, is found to exhaust the soil so much as to become effete, and were it not stimulated with ordinary manure for some time, the vegetables would not arrive at perfection. On fields cow-urine may be applied with advantage in wet weather on clover aftermath that is intended to be taken up for oats, to the extent of 12 to 15 tons per imperial acre; but it has been found to injure oats after *rye-grass.*

The substances I have mentioned may all be regarded as true manures, that is, as possessing a composition, the particulars of which contain the substances requisite for the maintenance of all the plants cultivated on a farm; but there is a class of substances which, until very lately, were never regarded as essential to the well-being of plants, namely, their *specific* constituents, which are *inorganic* or *mineral*. The vegetable organic structure, which forms the body of the plant, is so obvious, that its maintenance has only hitherto attracted the attention of cultivators, and the nature of its minute constituents has been overlooked by men of science. True, hints have been thrown out, that, in consequence of the want of success in cultivating plants in particular circumstances, particular substances may be required to supply the peculiarities of their composition; and several years ago Mr. Grisenthwaite expressed his opinion, that it was by their special constituents that plants were alone contradistinguished from each other, the organic structure being alike in all; and therefore recommended a minute

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analysis of all the cultivated plants to be undertaken, in order that the peculiar constituents of each might be ascertained. His reasoning on the subject was in these terms: "Elements, as the very term implies," he observes, "are now known to be incapable of being changed into each other. They admit, when considered *perse*, of no alteration but as regards magnitude and figure; and all the variety of matter discoverable in the world is produced by combination of these elements in different proportions. From this fact we are immediately led to deduce the following important conclusion: That when out of one substance another is to be formed, alcohol or acetic acid out of sugar, or, to confine our views to agriculture, grain out of manure, it is obvious that the elements of the first must be contained in the second; as if they be not, the conversion cannot take place. This is a truth which applies with peculiar force to the doctrine of manures, and renders it imperatively incumbent upon the agriculturist to investigate the constituents both of the crops he grows, and the manures he employs to make that growth successful. It is very reasonably to be feared, that many failures, quite inexplicable to the farmer, may be explained upon these principles. He has, very frequently perhaps, some grain upon land which has not contained the elements necessary to the production of the crop, and therefore the crop has failed; and he continues to suffer a recurrence of the same loss year after year, because he is unacquainted with the cause upon which it depends. If all crops were composed of the same elements, this reasoning, this discrimination, among manures, would not apply, nor be necessary to be regarded by the agriculturist; and it is upon such a supposition that the practices of husbandry have been uniformly conducted, and are at the present day conducted.

"To illustrate the preceding reasoning we may select the wheat crop as an example, which, while it is doubtless the most important to mankind, is also better known in its constituents than most other grain. If we examine the straw of wheat we shall find it to be composed of common vegetable matter; or of oxygen, hydrogen, and carbon. This I call *common vegetable matter,* because the elements are common to every known vegetable substance. If we examine the grain, we shall find its constituents to be starch and gluten; and if we carry our researches still farther, we shall find that the elements of starch are precisely the same with the element of common vegetable matter, viz., oxygen, hydrogen, and carbon; but the elements of the gluten, besides consisting of the three just named constituents, contain nitrogen also, an element not common to vegetable substance, but composing a large part of most animal matters. Now, from what has just been stated, it is clear that

the same manure which is employed in the production of the straw and the starch of the wheat crop, cannot possibly produce the gluten also. For this depends upon the presence of a distinct element, an element which cannot, as far as our present knowledge extends, be formed out of other elements, either by the operations of art, or by the process of nature, both of which are in reality the same. This is a fact which has never, I believe, been regarded by writers on the theory, or men engaged in the practice of agriculture; and yet upon it depends the successful cultivation of this most important crop."*

This extract really explains the entire motives by which the agriculturists at present desire to obtain the assistance of chemistry in raising larger crops and of better quality; and it contains the entire rationale of the doctrine of specific manures, the desire to apply which to field-culture has given the peculiar bias at present to the agriculturist's mind. It was reserved for Liebig to point out what those specific substances are which contra-distinguish the plants usually cultivated in the fields; and this knowledge he has acquired by the very means pointed out by Mr. Grisenthwaite, namely, by laborious analyses of the plants and of their products. His investigations in this difficult and interesting field of inquiry have enabled him to determine that ammonia is the most valuable food of plants; that supplies of it may be obtained for them by the decomposition of the various salts of ammonia; that other salts are required, if not directly, for yielding essential ingredients, at all events indirectly, for assisting in the decomposition of the ammoniacal salts; and that the ashes of plants indicate the peculiar mineral or minerals which each plant takes, in greater or smaller quantity, into its composition.

The employment of specific manures, recommended by theory in the first instance, and urged by the successful researches of chemical investigation, is now prescribed to the farmer as a practical operation; and it must be owned he has received the solicitation in a very confiding spirit, much more so than any subject I remember him to have received, which had not the previous sanction of his own experience. He has evinced a desire to try every suggestion offered, and has even gone the length of requesting a chemist of established reputation to examine the results of his experiments, and to suggest further experiments upon them, with a view to ultimately obtaining useful results. What those results may ultimately prove, time alone can determine; and as

* Grisenthwaite's New Theory of Agriculture, p. 161—4. Second edition, 1830.

every experiment in agriculture takes one year at least for its completion, that time must yet occupy several years. A great problem is evidently at work at present on this subject in the field of agriculture; and, as its object is decidedly good, I cannot but hope, for the sake of the country as well as the farmers, that it will be successfully solved. So long as it is under solution, however, I think the best plan for me is to decline entering into the subject of specific manures, because the mere enunciation, and much more the recommendation, of results, as yet untested is as likely to lead you into error, as to guide you towards truth; for repeated and extensive trials have yet to be made ere facts can be established; and without the establishment of indisputable facts no general conclusions for your guidance can be arrived at. The best service I can afford you at present is, therefore, to point out to you the best papers that have been written by the most extensive experimentalists; and as the subject admits of improvement by every new experiment, the accounts of the most recent experiments should possess the greatest interest. To open up the entire subject, would, besides occupy a much greater space than I have to spare; and if entered on at all in its present unfinished state, it could only consist of relating the particulars of what every experimenter had observed, and these you will appreciate far better in the experimenters own words.*

* See Transactions of the Highland and Agricultural Society for March 1844, pp. 161-204, by Mr. John Hannam, North Deighton, Wetherby, in Yorkshire. For patient investigation, accurate observation, clearness of detail and intelligent deduction, this paper, in my opinion, is a perfect model of an account of agricultural experiments. In the Number for July 1844, pp. 227-49, the experiments of Mr. A. F. Gardiner, overseer to Mr. Fleming of Barrochan, in Renfrewshire, are very well related. In the same Number, from pp. 250-4, the conclusions by Mr. Lumsdaine of Lathallan, in Fifeshire, are correctly drawn from the experiments, and are in themselves important. In the Number for July 1843, pp. 28-36, the account of the experiments made by Mr. Maclean at Braidwood, near Penicuik, in Mid-Lothian, with 28 different substances, at a considerable elevation above the level of the sea, are worth perusal; as well as some experiments by Mr. Carstairs of Springfield, near Penicuik, on the effects of some special manures on moss-land, which are curious and encouraging to those who possess similar soil. In the Number for July 1844, pp. 277-9, Mr. Thomas Bishop, land-steward at Methven Castle, in Perthshire, gives an account of experiments made with a few uncommon substances, such as grass-weedings, cocoa-nut dust, carbonised saw-dust, exhausted cow-dung, wet wasted straw, compared with known fertilizers, in the Number for October 1843, pp 64-7; and in the Number for October 1844, p. 304, and onwards, will be found one paper by Mr. John Finnie, Swanston, Mid-Lothian, and another by Mr. Charles Stevenson, Redside, East-Lothian. The Appendix to Professor Johnston's Lectures on Agricultural Chemistry and Geology is wholly occupied with accounts of experiments with special manures, made in different parts of the country, with such remarks upon, and suggestions from them, as the circumstances of each case called forth.

There are other substances employed as manure, very different from those just referred to, as well as from ordinary manures, and which can only be obtained in quantities in certain localities. For example, *soot* can only be obtained in large quantities from large towns, and it makes an excellent top-dressing for one season on grass. The quantity employed is about 40 bushels per acre, and the cost is from 1s. 3d. to 2s. 3d. per bushel. As this is a very disagreeable substance to sow with the hand, a machine has been in use for some years, for the purpose of distributing it equally over the surface of the grass-land, a description and figure of which, by Mr. Slight, will be found below. The effect of soot is to promote the growth of the leaves of plants, and particularly of grass, and to impart to them a dark green colour. I have heard it stated that cowfeeders object to graze cows on pasture that has been top-dressed with soot, in consequence of the taste which it imparts to milk; and they even object to purchase the hay for cows that has been saved from grass top-dressed with soot. The effects of soot are evanescent, not enduring beyond one season. It should be applied in spring when the grass is damp, and in calm weather. When applied in dry weather, it is apt to scorch the grass.

Woollen rags make an excellent manure for potatoes, when chopped small and strewed along the drills, at the rate of from 3 to 4 cwt. per acre on light, and 12 cwt. on strong soils. It is mostly used, however, for the manuring of hop-grounds. Trifling as this article may seem, 20,000 tons are annually used in England, as high as 5 guineas per ton.*

Green-weed of delicate variety, "found alone in protected situations in the estuaries of our rivers, is used in the upper parts of the Forth, and still more especially so in the Eden. Mr. Meldrum of Bloomhill, near St. Andrews, besides collecting the weed on his own shores, rents that of his neighbours. He frequently applies from 300 to 400 cart-loads in a single year, and reckons 10 cart-loads good, and 15 heavy, manuring. When laid on in winter, and ploughed into the furrow-ground, it produces a fine pulverising effect. With this alone a wheat crop of 6 quarters an acre has been produced, with a heavy crop of beans the year after without additional dung."†

Shell-fish and Shells.—I have known ground mussel and oyster shells used as manure for turnips; but double the quantity did not produce the same effect upon the crop as bone-dust; perhaps it would require 40 bushels to produce the same effect as 16 bushels of bone-dust. One use made of this shell-dust is to adulterate bone-dust therewith. It has

* Johnson on Fertilizers, p. 124.

† Quarterly Journal of Agriculture, vol. xi. p. 308.

been lately stated that common shell-fish, such as welks, cockles, and mussels, to the extent of 16 bushels per acre, have beeen employed with success to raise turnips, the bushel weighing 1 cwt. To those near the coast, with a rocky shore, such manure is obtainable.

Shell-marl.—In some parts of the country, such as Forfarshire, this substance is found in considerable quantities associated with peat. It occurs in beds in deep peat-bogs, lined above and below with a layer of very fine unctuous clay. It is taken out of the bogs by means of a boat mounted with a dredging apparatus. When of fine quality, and in a dry state, it is as white as lime, not crumbling down into powder like quicklime, but cutting something like cheese with the spade, and adhering in large lumps when spread. It is applied at the rate of from 40 to 50 bolls per imperial acre, the boll containing 8 cubic feet, and selling at 9d., making the cost of manuring from L.1 : 10s, to L.1 : 17 : 6 per acre, exclusive of the cost of carriage. When applied to land as a calcareous substance in moderation, it assists the action of ordinary manure; but it is too often applied solely as a manure, and in the above quantities, namely, from 35 to 45 cubic yards per acre, when it never fails to do mischief. It does not injure fresh land, it is true; on the contrary, it seems to stimulate it greatly, causing it to exert itself, and thereby soon becoming exhausted. When repeated frequently as a sole manuring, I have seen the land reduced to such a state of fermented dry pulverization, that with a stamp of the foot, the leg has been driven into the ground as high as the ankle, and a dust raised by the stroke. "Applied to lands followed by severe cropping," remarks Mr. Headrick, "it has reduced them almost to a state of utter sterility, which they have not recovered to this day."*

Besides those substances which attract the attention of most farmers, there are numerous others which may be used as manure, that are nearly overlooked by him, and these have been denominated *waste* manures. They comprehend all matters allowed to waste themselves on the farm; the sewerage of towns, which are allowed to run waste to an enormous extent; the waste of manufactures, such as shoddy, flax waste, sugar waste, tanners' waste, and the like; and local wastes, such as peat, weeds, ashes, &c. In regard to the importance of these substances as manures, trifling as they may seem, Mr. Hannam observes, in his preface, that, "while pointing out the waste of manure which too commonly

* Headrick's Agricultural Survey of Forfarshire, p. 406. In enumerating these substances, I have confined my observations to those which are within the reach of many farmers. For manures from more distant farms, I refer with pleasure to Mr. Hannam, of North Deighton's Essay on Rape-Dust and Hand Tillages.

takes place throughout the country; and suggesting available means for its prevention, the author has endeavoured to call attention to the subject, as of an equal importance to the farmer individually, and the public generally; for though to make that which is useless to the farmer valuable to him, and to give him an efficacious and economical agent by which he may augment his produce, *is* one means by which he may *reduce his expenditure and increase his income*, at the same time it is one from which the public will reap an *increased supply* of food at *a decreased* cost."*

Of the important part which every manure of the most trifling nature may play in the economy of husbandry, may be learned from these observations of Liebig: "It is certainly the case, that we could dispense with the excrements of man and animals, if we were able to obtain from other sources the ingredients on which depends all their value for agriculture. It is a matter of no consequence whether we obtain ammonia in the form of urine, or in that of a salt from the products of the distillation of coal, or whether we obtain phosphate of lime in the form of bones, or as the mineral apatite. The principal object of agriculture is to restore to our land the substance removed from it, and which the atmosphere cannot yield, in whatever way the restoration can be most conveniently effected. If the restoration be imperfect, the fertility of our fields, or of the whole country, will be impaired; but if, on the contrary, we add more than we take away, the fertility will be increased."†
—*From Book of the Farm, August*, 1844.

Further Notices regarding Peruvian and Bolivian Guano.—Horticulture.—General Virtues of Guano.

The following extract from 'Hovey's Magazine,' forms a portion of an address delivered by J. E. Teschemacher, Esq., at a meeting of the Horticultural Society of Massachusetts, United States, relative to the value of guano as a manure:—"In the following experiments, I will first observe that all those plants which were treated with guano were potted in a mixture consisting of plain earth without any manure, sand, a little leaf-mould and peat, with which the guano was mixed; that those plants which are compared with them have been grown in the richest compost, and that both have had the same attention, and been grown otherwise under the same circumstances. Fuchsia fulgens, one year seedling, potted 17th June, when 2½ inches high, with one tea-spoonful of guano; re-potted 9th August, then

* Hannam on the Economy of Waste Manures, p. vi., an excellent little treatise.

† Liebig's Chemistry in its application to Agriculture and Physiology, p. 177. Edition of 1843.

12 inches high, with another spoonful of guano, is now 1½ foot high. The contrast between this and the two-year old plant is very striking, both as to luxuriance of growth and colour of the foliage, the plant with guano being vastly superior. I think also that the colour of the flowers is improved; it is well known among gardeners that it is rather difficult to grow this plant well. Pelargoniums—two seedlings grown with guano, and one of the same sowing without; on the 17th June the two former were potted with one tea-spoonful of guano, and re-potted on the 9th August with another tea-sponful; here also the difference in favour of guano is very great. China roses—two cuttings, potted 17th June, each with one tea-spoonful of gauno; one was then 7 inches high, the other 4½; they are now 34 and 28 inches high respectively, with large healthy foliage and stems; these have not received a second application of guano. Celosia cristata, or cock's-comb—one seedling, with one tea-spoonful and one of the same sowing without; the size of the stem, foliage, and head of that with guano, is more than double that of the other, and the difference in the colour of the leaves is remarkable. Salvia patens, with one tea-spoonful of guano—the effect here has been to lengthen the joints, and the flower appears smaller than usual. Acacia Farnesiana—a seedling showing the size of the foliage and length of the joints, previous to the application of a tea-spoonful of guano, and the remarkable growth of both afterwards. A camellia with two tea-spoonfuls—this specimen, which was quite small and unhealthy before the addition of guano, as may be seen by the lower leaves, exhibits in a most marked manner, by its beautiful large deep green leaves and healthy bud, the action of this manure. On a camellia grown with a large proportion of fine-wood-charcoal, the foliage and buds are extremely fine and luxuriant, and of a healthy green colour, but not at all equal to that treated with guano. One balsam, two tea-spoonfuls, re-potted 9th August with two more, to which a little lime was added. This is an ugly specimen, which confirms an observation in the *Gardener's Chronicle*, that balsams manured with guano produced smaller flowers. I have watched it carefully, and found that not a single flower missed bearing its seed-vessel and that every seed-vessel I have opened contains from 14 to 20 perfect seeds. From what I have seen of guano it is clear that its action is rapid and powerful on the stem and foliage, increasing their size and deepening their green colour; of this fact there can be no doubt, I think it probable that it diminishes the size of the flowers in some cases, and that it improves the seed, both in quantity and quality; of this, however, more experiments are required to prove the certainty. When those plants were re-potted, which received a second application, the roots were very numerous and appeared in the most vigorous health—thick, succulent, pure white, the tips with that hairy appearance so well known by cultivators as a sign of strong growth. In Peru it is customary, when using guano

to raise pepper, to manure three times: first on the appearance of roots, then on the appearance of the leaves, and lastly on the formation of the fruit. I think the experiment of its action on all fruits, particularly the larger fruit-trees, as apples, pears, peaches, &c., will be extremely interesting, as well as on the vine, which is well known to be excessively greedy for rich food, particularly for bone manure, the chief ingredient of which, phosphate of lime, guano contains in considerable quantity." Mr. Teschemacher then proceeded to show that guano contained, in large proportions, the ingredients necessary for the growth of plants in general, and for the maturation of seeds. "The nectariferous juices, or, as they are commonly called, the honey in flowers, are usually separated or secreted by glandular bodies called nectaries, and this honey has by many been supposed indispensable in the fecundation of the seed; but there are also glands on the leaves and leaf-stalks (petioles) of many plants, which perform the same office of secreting honey; here, of course, it cannot be of use for this purpose. Such glands exist on the petioles or leaf-stalks of most of the acacia tribe; on the tips of three or four of the lower serratures on the leaves of Grewia, on various parts of the leaves or stems of the balsam, on passiflora, and many other plants. These glands only secrete honey during the youth and growth of the leaf; it is then only that their operation and beautiful structure can be properly observed. When the leaf has attained its full growth and perfection, the active part of these glands dries up, the time for observing their powers is past, and the leaf then proceeds in its owni mportant function of elaborating the sap. It has been lately surmised, and it appears to me with every probability of truth, that this honey is an excretion of the superabundant and useless part of the juices thrown off, after the leaf or flower has selected all that is necessary, precisely analogous to the excretions of the animal frame. I will attempt very briefly to show that this view, if correct, is of some importance, both to agriculture and horticulture. Mr. A. A. Hayes, of Roxbury, in a beautiful, simple, and, I believe, original experiment, before the Chemical Society of Boston, proved the existence of phosphoric acid (probably combined in several seeds), by immersing sections of them in weak solutions of sulphate or acetate of copper; in whatever part of the seed phosphoric acid existed, on that part was deposited a precipitate of phosphate of copper; this was particularly evident in the seeds of Indian corn. A certain quantity of phosphoric acid, or phosphates, is therefore necessary to the existence of these seeds; and that part of the plant (probably the flower) destined to perform the function of preparing the juices for these seeds, must go on exerting its utmost powers in selecting and rejecting until the requisite quantity of phosphates and other ingredients for the seed are obtained. Now the phosphates in most soils exist in extremely minute quantities; therefore, those plants and flowers whose seeds require them must extract large portions of

food from the soil before they can select the amount of phosphates necessary for the perfection of their seeds; and probably only as many seeds arrive at maturity as the plant can procure phosphates to complete; the remainder, embryos of which are always formed in abundance, are abortive—that is, never come to perfection. The same line of reasoning, of course, applies to the other necessary ingredients of seeds. If, therefore, we present to a plant food containing an abundant supply of these ingredients, it seems reasonable to suppose that we shall produce more seeds, or rather that more of the embryo seeds will be perfected. Now, the chemical analysis of guano shows that it contains, in abundance, most of the necessary ingredients of plants and seeds, the nitrogen of its ammonia being absolutely requisite for the cellular, vascular, and other parts of the stem and leaves, and its phosphoric acid, as well as its nitrogen, for the seeds; and if future experience should confirm what I have thus stated as an opinion, that the flowers of plants manured with gauno become smaller, it may be accounted for on the assumption that as there are presented to the plant these ingredients in abundance, particularly those necessary for the seed, the flower and its glands, whose office it is to prepare the latter, have less work to perform, less food to analyze, less to select, and less to reject; hence there is no necessity to have them of so large a size as where much exertion of these functions is required. The seed will also be larger and in greater quantity."

We shall forbear to enter on the chemical analysis of guano; it is more our province to show its effects, and to inform our readers how it may be most efficiently employed in horticulture. We have in progress various experiments to assist in proving its value; and, as far as these have gone, they have in general been most satisfactory. We have already proved that it may be used too freely, and that injury may be thereby produced. In a liquid state (four ounces to a gallon of water), applied twice a week for three weeks, to beds of strawberries, has occasioned an amazing growth of foliage and blossoms, but its influence on the crop of fruit remains to be seen. On the other hand, a bed of seedling Alpine strawberry plants, which had been up about a month, was thinly sprinkled with unmixed gauno in powder, and it destroyed every plant where it was applied. The half of a bed of onions, which were six inches high, were sprinkled over a month ago with pure guano, at the rate of two ounces to every square yard, being upwards of 5 cwt. to the acre; the season has been rainy, and the onions treated with guano are double the size of those not so treated. Potatoes, which were six inches high, had guano sprinkled along the rows, amongst their stems, at the rate of an ounce and a half to every yard: and these are now (five weeks subsequently) far superior to

those in parts of the rows purposely left without guano. Nine parts of light soil were mixed with one of guano, and half a spadeful of the compost was put into each of the holes regularly made to receive it, in a prepared bed of light soil; in the midst of the compost in each hole, a plant of Brussels Sprouts was put, and then well watered. This was done a month ago, and at the present time more than half the plants have dwindled and died. Geraniums were watered at intervals of a week, five times only in the whole, with guano water, four ounces to the gallon of water; their leaves began to curl, and, although the use of the liquid guano has been discontinued two months, it is unlikely that the plants will recover till they are potted in fresh soil. Plants of various sorts, in pots, watered only with guano water, half an ounce to a gallon, have flourished astonishingly—none have failed. These are lessons which cannot be mistaken.—*Hovey's Magazine of Horticulture.*

Experiments on Various Flowering Plants, with Guano and Nitrate of Soda. By J. E. TESCHEMACHER.

Small parcels of the new manure guano having been very generally circulated in this vicinity, it is right to put those in possession of it on their guard against using it too freely; many plants in England, and some here having been killed for want of proper care in the application of it. Guano is an extremely powerful and warm manure, and, if applied in large quantities, or in lumps, destroys the roots. For pelargoniums, roses, and all hardy, strong-growing plants, one teaspoonful to a quart of earth, or about 1 part in 100, is sufficient; it should be pulverized and well mixed with the earth in which a plant is to be re-potted. When it is not convenient to re-pot, the earth may be gently stirred on the surface of the pot one or two inches deep, add guano pulverized, then mixed in; the plants should be kept well watered. Besides pelargoniums and roses, I have tried it on the Myrtaceous family, on ericas, fuchsias, and camellias; its effects on these are equally surprising. I have been also trying experiments on various plants with nitrate of soda; in every case I placed two plants, of the same species and of nearly the same size, close together; one of them was watered three times a week with a very weak solution of this salt; the other was under the usual management. The effect of the nitrate of soda has now become very evident, the plants watered with it are larger and earlier in bloom than the others; it appears, however, to me probable, that these effects will be rather evanescent, and the plants will always require this stimulant. I observe, in the English publications, that this constant necessity for the stimulant is urged against all these new manures, but surely there is no strength in this argument. All manures become exhausted, and the farmer has always to apply the stimulant of his manure-heap to make his land bear. From some experiments I have made, I think that guano will prove

a manure of much greater permanence than any that is now in use, particularly in soils deficient in phosphate of lime.—*Hovey's Magazine of Horticulture.*

The superintendent of the hardy department reported that he had tried several experiments with guano upon plants in pots. In loam, containing one-fiftieth part of this substance, verbenas and salvias became luxuriant in about the same degree as if potted in rotten dung. The same plants also flourished exceedingly in sand containing a similar proportion of guano. The same effect, or even a more beneficial action, was produced upon them when peat was substituted for sand. But when rich garden soil was employed with the same proportion of guano, the plants became languid and died. It was therefore inferred that the value of guano as a manure, will depend upon the soil with which it is employed, and that a quantity which would be highly beneficial in poor soil will become deleterious upon land previously rich and well manured.—*Proceedings of the Hort. Soc. No.* 17.

PEAS.

I have used guano on strong brick-earth at the rate of 30 cwt. per acre, with considerable advantage, as you will see by the accompanying pea, and they are all much of a size in the row; it was applied after they had grown about 12 inches. I mention this fact as there appears amongst your correspondents considerable doubts as to the maximum quantity of guano. Less than the above would kill grass, and no doubt would be dangerous on hot gravelly soils, or even on undrained clays that would cake near the surface. I have applied more than a ton and a half per acre on my flower-garden, in addition to considerable quantities of bone-dust, soot, salt, and nitrate of soda; and the extraordinary luxuriance of their growth, and the size of the flowers in a cold aspect, bear testimony to its utility. Care should be taken to apply it before or during rain, and not to allow it to touch the foliage. My potatoes and other vegetables appear to like the guano. On 8 acres of oats, on recently-drained strong land, I have used 4 cwt. of guano per acre on 3 acres; 4 cwt. of guano and 1 sack of common salt on 5 acres. In both cases the crops look well, although on poor exhausted soil after wheat; but where the salt is added there is a vast superiority, although that part of the field was sown at least a month later than the other; the difference is perceptible a quarter of a mile off. On another field of oats, 6 acres sown same time as the 5 acres, with one sack of salt and no guano, the corn looks healthy, but far inferior to that manured with guano. Two stetches on which were neither salt nor guano look yellow, miserable, and thin.—F. S. M. —*Gardeners' Chronicle, July* 1, 1843.

FIELD AND GARDEN PRODUCE.

Walton-Nursery,
Near Liverpool, 15th February, 1844.

SIR,—I beg to acknowledge your letter of the 12th instant, and in answer to your question respecting the durability of guano as a manure, I have great pleasure in giving you my opinion, which is founded on experiments with the guano I have had *from your house during the* last three years. I am now thoroughly convinced that guano *is not* only a most valuable manure for the first crop, but for crops for years after, according to the quantity at first applied.

I have noticed minutely the effect of guano on the crops for three successive years, where it was first applied at the rate of 4 cwt. to the statute acre. The first crop was grass, the second turnips, the third oats, and every year each of those crops were excellent and decidedly better than when I applied 20 tons of farm-yard manure to the same quantity of land adjoining. There is, therefore, no longer any doubt in my mind about the lasting qualities of genuine guano as a manure, where it is properly applied for permanent purposes, nor can there be any doubt of its being the cheapest manure we know of; for in the experiments I allude to, the guano cost 2*l.* 8*s.*, the farm-yard manure 10*l.* 10*s.* per ton, being the common price for the best horse and cow dung here in the spring time.

In this neighbourhood a great deal of guano has been used for top-dressing grass land at the rate of 2 cwt. to the acre, and in all cases that I have heard of, it has given very great crops the first year; but some of the parties who have used it in this way, complain that they did not see much improvement in the crop the second year; I should have been very much surprised if they had, for I have many times seen 5*l.* worth of farm-yard dung applied as a top-dressing to an acre, and never could see any advantage of it after the first year. If people want manure to have a permanent effect, let them bury it in the land, and they will have the benefit for years, but if they take and scatter it to the sun and wind, without ploughing or digging it in, they will never see its effect after the first crop.

I continue to use guano to crops of all kinds on my farm or garden, and in my nursery grounds, and in a liquid state I have used it in my hothouses and greenhouses, to plants of every kind with great benefit to all.

In market gardens and kitchen gardens of any kind, I consider guano invaluable; for by proper application of the liquid in the spring months, you not only double the quantity of many crops, but with such as rhubarb, sea-kale, asparagus, &c. you get them much earlier, which is a double advantage. In short, in all the departments of my business, whether the farm or nursery, guano seems now indispensable. Whenever we see a crop not thriving, we apply guano the first *wet* day afterwards, and if the crop is not too far advanced, it generally has a very good effect.

Manure is the mainspring in all farming or gardening operations; without plenty of it, our labour is in vain. We may drain well, subsoil, plough or dig deep, but without abundance of manure, land can no more be *profitably* worked than a horse can that is half fed.

With the assistance of guano, I had plenty of grass to mow last year from the first week in April until the first week in December, besides a good bite of after-grass grazing. To conclude, I beg to state, as my opinion, that the discovery of guano is by far the most important of the age, either for agriculture or horticulture, and I for one feel particularly indebted to your for its introduction into England.

I am,
Your most obedient servant,
WM. SKIRVING.

William Joseph Myers, Esq.

POTATOES.

With potatoes, 4 cwt. of guano per acre, mixed with ashes, was tried against 15 tons of farm-yard and stable dung. The potatoes with the guano were of the same sort, but planted a fortnight later than those with dung. The difference in the product was at the rate of 11 sacks of large and 5½ of small (seed and refuse) per acre in favour of the guano. In each case the produce of 5 perches was measured.

In the cases of potatoes and turnips, the trials were made in the same field, and on parts adjoining one another. The soil, clay.

AGRICULTURE.

To the Editor of the Mark Lane Express.

SIR,—If you think the following observations on guano, crops, Scotch farming, &c., worthy a place in your invaluable paper, you may at pleasure insert them.

1st. On an 8-acre field, sown with 3 cwt. of guano and 3 bushels of Italian rye-grass per acre, on the 29th of April, cut on the 3rd of August, weighing when cut 18 tons, and when dry and ready for stack 4 tons per acre. Much of this crop was upwards of five feet long; so rapid was the growth that fifty hours after cutting, it had again sprung up to the height of 3⅝ inches. With such grass, and such manure so easily convertible into liquid, I see no reason to doubt that the cottager, with his 5 roods of land, could supply his house with vegetables, and cow with winter and summer food, thereby providing for his family an almost entire subsistence.

What intelligent agriculturist can view without regret the richest plains of England lying in a state of nature, in what are called "meadow lands," on which are laid a large portion of the best dung from the farm-yard (not from the liquid tanks, which would be infinitely better), there to be exposed to, and carried off by, the

atmosphere? Surely in this day of intelligence those lands might be turned to better account.

2nd. Two cwt. of guano mixed with 2 cwt. of gypsum, sown upon an acre of oats on the 17th of May, which had a powerful effect in producing a growth; but in this case it did harm by laying the crop flat to the ground, thereby deteriorating the quality of both straw and grain, at the same time proving itself to be most valuable where the land is too poor for a crop.

3rd. Six cwt. of guano produced a crop of potatoes equal to that of 20 tons of farm-yard dung.

4th. One acre of yellow bullock turnip, manured with 4 cwt. of guano mixed with an equal quantity of gypsum, produced a crop of 30 tons; one acre done with 2 cwt. of guano mixed, produced 27 tons. The portion done with the 4 cwt. pushed at first a rapid growth into the tops, so that for a long time that done with the 2 cwt. bade fair for the best crop, but when the tops of the first portion began to fail they shot past the other, and took their place in degree of crop, as will be seen by the above weights. Along with all my turnips I sow 1 cwt. of gypsum per acre, mixed with a like quantity of wood or other ashes, in such a damp or wet state as will pass freely through the machine, which greatly assists in the first stage of vegetation.

On no account would I sow such manures as guano, &c., upon the surface for a turnip crop, which is too commonly done by machines for the purpose. Although those machines have coulters making ruts of two or three inches deep, for receiving the seed and manure, yet the depositing of that manure so near the surface induces the plant in seeking food to push its roots along the top of the drill, thereby exposing them to all the changes of our variable climate, and materially checking the growth of the plant. Another evil attending sowing manure on the top of the drill is, that in the first hoeing or thinning of the turnips, a large portion of such manure is drawn away from the plant altogether. The manure for a turnip crop ought to be deposited in the bottom of the drills, and then covered in about six inches deep, the seed then sown on the top of the drills along with the before-mentioned mixture, the plants will then push their roots in the natural direction, where they will find their food in a comparatively uniform temperature.

Greenlands, 17th February, 1844.

Dear Sirs,—The merits of guano are so thoroughly appreciated in this neighbourhood, that I should consider the publication of experiments at the present time uncalled for.

I enclose you a hand-bill which Mr. Brocklebank's manager had printed for circulation amongst his friends some time ago. In the first experiment it was found that 4 cwt. of guano produced as good a crop of turnips as 25 tons of farm-yard manure. The cost of the guano may be taken on the spot at 50*s*. as the extreme, whilst the

manure cannot be valued at less than 12*l.* 19*s.* The barley following the turnips was a fair average crop, as was the hay; and on walking over the field at this season, I can distinguish the part manured with guano by its superior greenness and condition; it has a richer appearance than the remainder of the field. We find that by harrowing in with barley, at the time it is sown, 2 cwt. of guano per acre, we increase the yield of barley 3⅔ Carlisle bushels. The guano costs 25*s.*; the barley so obtained is worth 44*s.* I say nothing of the increase of straw and superior appearance of the sown grass, both of which are obvious.

From the meadow top-dressed with guano, at the rate of 3 cwt. per acre, in 1842 we had again a very good crop; in 1843, fully equal to that of 1842. The guano cost 1*l.* 17*s.* 6*d.* To have procured the same effect with manure, would have cost not less, certainly, than 7*l.* per acre.

The application of guano to oats has been as favourable as to barley, but I have not particulars at hand. I cannot speak to its effect on wheat, because the soil here is not suited to its growth. From the experience I have had of guano I am satisfied its introduction has raised the value of land situated at a distance from towns, but more especially of that where the soil is light.

It is admitted that the object of good farming is to produce the greatest quantity possible on a given quantity of land. To attain this object on soil such as I am accustomed to, I would use 2 cwt. of guano per acre on ploughing out of grass for oats, harrowing it in with the seeds. I would procure my turnips with the aid of 3 cwt. (4 cwt. causes them to be too gross, and on that account not to keep well) guano, to be eaten off by sheep or drawn; and I would, again, use 2 cwt. guano on sowing the barley, with which crop I would again lay the land to grass.

This system, I believe, from my experience, may be profitably followed, and the land be left in good condition; but it is evident from what I have detailed of the relative cost of guano and manure, that without the introduction of the former it would have been impracticable. It must not be forgotten that the use of guano, by increasing the produce to be consumed on the farm, increases the farm-yard manure. I repeat, the introduction of guano has added materially to the value of many estates.

I remain, dear Sirs,
Very truly yours,
THOMAS FISHER.

Messrs, Gibbs, Bright, & Co., Liverpool.

I consider the quantity of guano requisite

For Carrots,	4	cwt. per acre,
Turnips,	3	,,
Pasture, land	8	,,
Hay ground,	3	,,
Barley,	2	,,
Oats,	2	,,

New House, 24th Feb., 1844.

DEAR SIR,—In reply to yours respecting the durability of guano as a manure, I only can give you the result of my experience from 1842 to the present time. On the 21st of June, 1842, I manured 3 acres for turnips with 2 cwt. of guano and 12 bushels bones per acre, mixed together 14 days before sowing; 1 acre with sulphate of ammonia, 4 cwt. to the acre; 1 acre with 4 cwt. of guano without any mixture; 1 acre with night-soil and ashes; and 1 acre with 15 loads of well-rotted farm-yard manure; the turnips were all sown on the 21st and 22nd of June, on drills of 26 inches asunder; in the month of November following, I had ¼ of an acre of each taken up, and topped and tailed, and the bulbs weighed as follows per acre.—

	T.	Cwt.	qr.	lb.
Guano alone, ..	20	11	1	21
Bones and Guano,	18	13	1	14
Ammonia, ...	17	0	3	0
Farm-yard manure, .	16	6	1	0

I sowed the field with oats and seeds in the spring of 1843; they were a very heavy crop all over the field, without any perceptible difference, and the seeds the same; upon a field of 5 acres, on another farm, in the same year, I manured 3½ acres with well-prepared farm-yard manure, and 1½ acre with 6 cwt. of guano, all upon the ridge of 26 inches; the turnips sown in June were all a good crop, but the 1½ acre manured with guano showed more superiority over that manured from the farm-yard than in the first field; this field was sown with barley in the spring of 1843, and at harvest the superiority of the barley-crop was even more conspicuous upon the 1½ acre than the turnip-crop, as I am convinced there were at least 6 bushels per acre more upon this than the other part of the field; and the seeds that were sown with the barley are at present far superior, so much so, that you may see to the inch where it is long before you reach the field; here is an evident superiority in the three first crops, viz. turnips, barley, and clover, and I have no doubt of the result of the wheat-crop, as a good clover-crop insures a good wheat crop. I have had many other proofs this last season of its superior fertilizing qualities over every other manure that has been put in competition with it, upon turf of different quality and texture, and as a manure for potatoes, but no doubt you have plenty of testimonials of its utility in these and other things.

To Mr. J. W. Myers.

I am, Sir,

Yours truly,

SAMUEL BELL.

Mangel Wurzel.—In answer to the inquiries of "A Correspondent," at p. 216, respecting the application of genuine guano to the mangel wurzel crop, I beg leave to offer the following particulars of the method adopted by my gardeners last spring:—Drills were drawn 6

inches in depth and 2 feet apart, into which the guano was strewed at the rate of 1lb. to 15 yards, and covered over with an inch of mould; above this the mangel wurzel seed was afterwards sown. The produce of the seed thus treated was fully one-third more than of that which received a dressing of farm-yard manure, the average weight of the roots being from 8 lbs. to 9 lbs.— *E. S.—Gardeners' Chronicle, 27th May,* 1844.

WEST INDIES.

SUGAR CANE.

Extract from one of eight Treatises on agricultural subjects, published in Jamaica, having been written for a Prize of One Hundred Guineas, offered by Lord ELGIN, *the Governor of the Island, to be awarded to the author of the best Essay on these subjects.*

"On the 6th July, 1842, we applied 5 tons of guano to land turned up with the plough. The soil is light small-shot, or manganese, the poorest we have. The quantity given was one pint to four feet; and as there was more land opened than the guano would manure at this rate, we applied common compost from the cattle-pen to the remainder, in the usual way and quantity: I have thereby been enabled to contrast their comparative merits. The canes by both methods of manuring were planted at the same time. Those with the common compost will be fit to cut in the usual time for plants, say *fourteen or fifteen months old.* Those with guano must be cut in June, or at *eleven* months old. At this rate did their comparative growth commence, and so it has continued to maturity." To this is added the following additional report:—"The canes planted with guano in July, 1842, are now made into sugar (June, 1843). They have made excellent produce. In quantity they have exceeded the plants manured in the usual mode at the rate of one-eighth of a hhd. per acre. Had they been cut six weeks sooner, their produce would have been still greater.

The mixture recommended is one-sixth guano to five-sixths of a quart, consisting partly of ashes, marl, if at hand, and mould.* The quantity of this mixture to be applied is one quart to every four feet.

The author of this treatise, in a letter dated the 25th July, 1843, says—"The first ratoon sprouts from the roots of the plants lately cut, and which were originally manured with guano, are coming up with a rapidity which many would consider magical, without any further application of manure."

Barbadoes, 23rd August, 1843.

"Less than half a ton is not sufficient to manure an acre of canes in a proper manner; it is getting into high estimation as a manure,

* This quantity is probably sufficient, but it is only one-third of what was used in the experiment above detailed.

and the canes manured with it are greener than those which have been manured with animals."
"WM. SHARP."

Jamaica, 22nd August.

"From what I have seen of the application of guano, I think great benefit will be received from it. The effect on a piece of ratoon canes to which it was applied, at the rate of ½ a ton to the acre, was remarkable. It caused the canes to take a rapid and luxuriant growth, so that they covered the ground in a very short time, which saved one clearing, if not more, and a great advantage, keeping the land cool. I have seen sugar made from land manured with guano: the colour was not quite equal to some on the estate, but the quantity more than doubled."

COFFEE.

Jamaica.

"At present, we may say, that guano having been found elsewhere a highly beneficial application to fruit-trees, there can be little doubt that where cultivation has declined from the age or heavy bearing of the trees, or from the exhaustion or washing away of the soil, benefit would be derived from the use of it or some of the other strongly stimulating manures now in general use. From the chemical analysis of guano, it appears particularly suited to the coffee-tree. This, however, is only to be tested by actual experiment. We will give all the information we possess as to the proportions used, and the mode of application to fruit-trees elsewhere, and the results as they become known; and we cannot doubt that practical men will be found to test its effects by experiment. We must, however, repeat the caution given in another column of our paper, and beg purchasers to be careful in obtaining what is genuine. The results of guano on grass-lands must be highly interesting to many whose pastures have suffered from various causes. Its application has produced effects scarcely to be credited if they were not well authenticated. One form of applying it, strongly recommended, is very simple and easily tried. On 1 lb. of good guano pour 8 gallons of water, let it stand 24 hours, then add 8 gallons more water, and let the whole stand 48 hours. This water may be applied to grass-land or vegetable gardens, it is stated, with the best results. A watering pot would help to distribute it equally; others recommend a stronger solution, 4 lbs. of guano to remain in 12 gallons of water 24 hours: the water to be then drawn off for use, 12 gallons of fresh water may be put on the same guano, and after lying 48 hours, be used as the first. A trial of both these proportions will test their comparative value."

Monthly Proceedings of the Society.

(*Wednesday, the 9th October,* 1844.)

The Hon'ble Sir J. P. Grant, *President,* in the chair.

The Minutes of the last general meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz. :—

Messrs. Macleod Wylie, F. Stainforth, John Jenkins, Richard Stuart Palmer, H. C. Metcalfe, Cecil Beadon, and Baboo Hurrynarain Day.

Candidates for Election.

The names of the following gentlemen were submitted as Candidates for election :—

R. Leishman, Esq. Calcutta.—Proposed by Mr. Wm. Storm, seconded by the Secretary.

Capt. A. Waugh, (Surveyor General of India).—Proposed by Dr. Huffnagle, seconded by Dr. Egerton.

G. G. Balfour, Esq. (Civil Service).—Proposed by Mr. W. St. Quintin, seconded by Mr. E. Jenkins.

Presentations to the Library.

1.—Madras Journal of Literature and Science, No. 30.—*Presented by the Madras Literary Society.*

2.—Journal of the Asiatic Society of Bengal, Nos. 62 and 63.—*Presented by the Society.*

3.—Five copies of Appendix A., Lists A. to L. of Dr. Griffith's Report on the H. C. Botanic Gardens, Calcutta.—*Presented by the Govt. of Bengal.*

4.—The India Review and Journal of Foreign Science and the Arts, No. 9 of vol. 1.—*Presented by the Proprietor.*

5.—The India Journal of Medical and Physical Science, Nos. 9 and 10 of vol. 2.—*Presented by the Proprietor.*

6.—Report of the Sudder Dewany Adawlut. N. W. P. on the administration of Civil Justice for 1842.—*Presented by the Govt. of the N. W. Provinces.*

Garden and Museum.

1.—A large cask of Peruvian Guano.—*Presented by W. P. Grant, Esq.*

2.—A small quantity of acclimated Cotton seed, the produce of the Lucknow Garden.—*Presented by Capt. G. E. Hollings.*

3.—One hundred specimens of the woods of Arracan.—*Presented by Lieut. Wm. F. Nuthall.*

Lieut. Nuthall mentions, that many of these woods are so very tough that they would answer admirably for Indigo presses,—indeed superior to any wood procurable in Bengal. Should any information

be required in regard to any of these samples (all of which are numbered,) Lieut. Nuthall states, he will be glad to afford it, as also larger specimens of any that may be approved of.

The special thanks of the Society were voted to Lieut. Nuthall for this useful present, and for his kind offer of further assistance.

4.—Two musters (Pekoe and Souchoung) of Tea made in Assam. —*Presented by Wm. Storm, Esq., on behalf of the Directors of the Assam Tea Company.*

Mr. Storm states, that the average sale of this Tea in the London Market exceeds that of the China tea.

5.—A small model of a Wooden Chain-Pump from Chusan. —*Presented by Dr. Alexander Grant.*

6.—Two samples of *Sunn* grown at Bauglepore.—*Presented by Major Napleton on behalf of Baboo Gooroochurn Mitter.*

Mr. Law, in reporting on these samples states, that parcels as well cleaned as No. 1, generally bring about £22 per ton in the London market, but that No. 2 would not bring above £15 to £16 per ton.

The Patron of the Society.

The Secretary intimated to the meeting that, in consequence of the departure of Lord Ellenborough, a vacancy had occurred in the office of Patron of the Society; whereupon it was unanimously resolved, that the President be requested to wait on the Right Hon'ble the Governor-General, with the view of soliciting his Excellency's acceptance of the office.

Metcalfe Hall.

The Secretary laid on the table a statement which showed the receipts and disbursements on account of the above Building. The original estimate was Rs. 48,921-9-0; the final cost, in consequence of various additions to the original design, Rs. 67,566 : 6 : 3. The sums paid amount to Rs. 52,402-8-6, leaving a balance due of Rs. 15,163 :13 : 9 to the builders, besides 6,000 to the Union Bank, which had been borrowed to meet advances, making a total of Rs. 21,163 : 13 :9 due on account of the Building. The Secretary stated, that he had received a letter from the Hon'ble Sir Herbert Maddock, intimating that the Governor-General was desirous of putting his name down for Rs. 500 towards the fund that it had been proposed to raise by subscription, and that he, Sir Herbert, would give Rs. 250. Several other subscriptions were intimated. With regard to the Society's taking possession of its rooms, the Secretary read, at the request of the President, the substance of a letter which was to be addressed to the Builders, and which it was hoped would remove all difficulties.

Floricultural Exhibition.

A report from the Garden Committee submitting a list of prizes for flowers, and for a few vegetables and fruits, to be awarded from Sir Lawrence Peel's first quarterly donation of one hundred rupees, was read. The Committee suggest, that the show be held on Monday the

14th instant at 10 o'clock, being the day and hour fixed for the quarterly show of vegetables and fruits. The Report was confirmed.

Formation of an Oil Committee.

The Secretary intimated that, with reference to the resolution of the last meeting, requesting him to arrange for the formation of a permanent Committee, to be denominated the "Oil Committee," he had the pleasure to submit the names of the following members, who had consented to act on such Committee, viz :—

Dr. Mouat, Messrs. Wm. Haworth, James Cowell, H. Mornay, John Allan, H. C. Kemp, and Baboo Ramgopaul Ghose.

It was proposed by the President and resolved, that the above-named gentlemen do constitute the Oil Committee, and that it be incorporated in the list of the Society's Standing Committees.

East India Sugar Question.

The paper that was next read was a long and interesting communication from Mr. Sconce, at Chittagong, submitting whether some prominent steps should not be taken by the Society for the purpose of representing the interests of India in the question of Sugar, with reference to the approaching proposed change of customs' duty by the British Parliament.

At the close of the perusal of this letter, it was agreed, that the best thanks of the Society be given to Mr. Sconce, and that the subject-matter of his communication be referred for report to a Special Committee, consisting of the following gentlemen, viz :—

Messrs. John Allan, James Cowell, John Cowie, W. F. Fergusson, William Haworth. Charles Huffnagle, and Joseph Willis.

Chinese Agriculture.

The Secretary next drew the attention of the meeting to an highly interesting paper from the pen of Dr. Alexander Grant (H. C. S.) lately attached to H. M.'s 55th Regt. at Chusan, entitled "A Diary of Chinese Husbandry, from observations made at Chusan in 1843-44, illustrated by drawings of the implements of Agriculture, and of Rural Scenery,"—and read the following communication from that gentleman, presenting the above paper and drawings :—

To James Hume, *Esq., Honorary Secretary to the Agri-Horticultural Society of India.*

Dear Sir,—I have not been unmindful of the request conveyed to me in your letter of the 29th August 1843, acknowledging the receipt of my answers* to the queries respecting Chinese manures, circulated by the Agri-Horticultural Society of India. The paper which accompanies this note, contains the result of my observations, and I shall feel gratified if they tend to throw any new light on the useful subjects, which engage the attention of the Society. The kindly

* These answers are published in the second volume of the Society's Journal. —*Sec.*

disposition of the Natives, and the absence of every prejudice, have now afforded for the first time to Europeans, free opportunities of making an examination into their social condition, and I have in my almost daily walks availed myself of this new state of matters. The drawings of the implements of Agriculture were made at a single foons house—its owner a man of very moderate means. They are, I believe, the first complete set of the kind presented to the public.

Before the next meeting of the Society, I shall forward some drawings descriptive of lime, brick, and tile-making, as practised in the North of China. I was induced to notice these subjects by observing that the Royal Agricultural Society had, at their meeting in 1843, granted a silver medal for a patent machine for making tiles and bricks by severing the clay with wires; this method is in common use among the Chinese.

I beg to present the Society with a model of a Wooden Chain-pump from Chusan.

I am, &c.
(Signed.) Alexander Grant,
Asst. Surgeon.

Calcutta, 8th October, 1844.

On the motion of the Hon'ble the President, it was unanimously agreed, that the special thanks of the Society be given to Dr. Grant for his useful and interesting paper and drawings, and that they be referred to the Committee of Papers, with a view to their publication in the Journal.

The Assam Tea Plant, compared with that of China.

The Secretary mentioned that, since the last meeting, he had received, through Major Jenkins and Dr. Wallich, a paper which had been drawn up by Mr. J. W. Masters, regarding the identity of the Assam Tea plant with that of China; also a packet of dried specimens of the Tea plants therein alluded to; and that with the view of giving the communication (which came to hand just too late to be presented at the last meeting,) a place in the number of the Journal now in the press, he had, in anticipation of the Society's sanction, transferred it with the specimens to the Committee of Papers. The best thanks of the Society were given to Mr. Masters for this interesting paper.

Carey Testimonial.

A communication was read from Dr. Royle, intimating that he had given the Society's commission for a bust of Dr. Carey to Mr. Lough. The following is an extract of Dr. Royle's letter on the subject:—

"I do not know whether I mentioned in my former letter that I had given your commission for a Bust of Dr. Carey to Mr. Lough; I was myself so much struck with a work of his which I saw at Sion House, the Battle of the Standard, that I procured an introduction to see his studio. His works in last year's exhibition, raised his name so

high, that I had no difficulty in determining upon the sculptor. Since then he has exhibited his two great works— a king making a knight-banneret, and a wife finding the dead body of her husband on the field of battle, by his charger remaining by the body. The Queen has also given him the commission for her statue for the Royal Exchange, and he is executing the monument with a reclining figure of Mr. Southey. So that your Bust will be executed by one of the leading sculptors of the day, if not the leading sculptor."

Communications on various subjects.

1.—From Dr. Royle, forwarding copy of a letter from Mr. Groom, respecting the assortment of bulbs transmitted by him to the Society in 1843-44, the bill for which, amounting to £54, was submitted at a former meeting in April last.

Resolved. With reference to the difference of opinion in regard to the quality of these bulbs, that Dr. Griffith be requested to address those parties in the Upper Provinces to whom portions of the supply had been sent by him, and that, on receipt of their replies, he be further requested to favor the Society with a report on Mr. Groom's letter. Dr. Griffith, who was present, consented to carry out the wishes of the Society.

2.—From Capt. W. W. Dunlop, Secretary of the Branch Society at Cuttack, reporting on the various seeds received from the Parent Society, sown in their Garden.

3.—From James Cowell, Esq., intimating that it would be advisable, before incurring the expense for a large supply of madder seed, as suggested at the last meeting, to indent for a *small* consignment, in order to test its applicability to the country, and that with this object in view, he had taken steps to procure for the Society about one cwt. of the seed from Belgium or the South of France.

The best thanks of the Society were given to Mr. Cowell for the consideration and trouble he had taken.

4.—From G. C. Cheap, Esq., dated Bauleah, Sept. 10th, giving the result of trials with the Affghanistan seeds presented to the Society by Major Wm. Anderson.

5.—From Col. J. R. Ouseley, promising to obtain the required information regarding the white linseed of Hoosungabad.

6.—From L. Wray, Esq., offering his assistance to procure from his friends at Manilla, such rare plants or seeds as the Society may require.

Mr. Wray's offer was accepted, and the Secretary was requested to tender the thanks of the Society for the same.

7.—From Cecil Beadon, Esq., Under-Secretary Govt. of Bengal, offering the best thanks of the Right Hon'ble the Governor, for the gratuitous supply of cotton seed for the experimental farm at Dacca.

8.—From A. Rogers, Esq., Honorary Secretary Assam Company, offering the best thanks of the Company, for three copies of the Journal of the Society, Part 1 of Vol. 3.

9.—From Captain G. E. Hollings, entering into some interesting particulars regarding various cultures in the Lucknow Public Garden.

For all the above communications and presentations, the best thanks of the Society were accorded.

(Wednesday, the 13th November, 1844.)

W. Storm, Esq. in the chair.

The Minutes of the last general meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting, were duly elected members of the Society, viz :—

Capt. A. Waugh, Messrs. R. Leishman and G. G. Balfour.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Mr. J. G. Lewelyn, Calcutta.—Proposed by Mr. G. F. Remfry, seconded by the Secretary.

E. V. Irwin, Esq., Civil Service, Tirhoot.—Proposed by Major T. E. A. Napleton, seconded by the Secretary.

Charles Macleod, Esq.—Proposed by Mr. W. G. Rose, seconded by Mr. W. Storm..

Presentations to the Library.

1.—Reports of the Bombay Chamber of Commerce for the 3d and 4th quarters of 1843-44.—*Presented by the Chamber.*

2.—Calcutta Journal of Natural History, No. 19.—*Presented by Dr. M'Clelland.*

3.—The Indian Journal of Medical and Physical Science, No. 10 of Vol. 2.—*Presented by Dr. Eveleigh.*

Garden and Museum.

1.—A few roots of the *white* sweet potatoe from the Sumbulpore District.—*Presented by Col. J. R. Ouseley.*

Colonel Ouseley observes that this variety is unknown in Upper India and Behar, and is said to be also unknown in Calcutta; in that case he offers to send a large supply, as they are much better than the *red* kind.

The Secretary mentioned he had requested Col. Ouseley to favor the Society with a large supply, for culture at the Nursery Garden, with a view to future distribution.

2.—Sample of coffee, the produce of Captain Brodie's Garden at Seebsagur, Assam.—*Presented by John Owen, Esq.*

3.—Sample of cotton grown at Rungpore from New Orleans seed, acclimated at the Coimbatore Government farms.—*Presented by H. Rehling, Esq.*

4.—A piece of teak timber and samples of tobacco and cotton from Arracan.—*Presented by Major Bogle.*

Horti-Floricultural Exhibition.

A list of native gardeners, to whom prizes to the amount of 200 Rs. were awarded at the show of indigenous and foreign vegetables, fruits and flowers, held on the 15th of Oct., was first submitted. In the remarks appended to the list it is mentioned, that upwards of 150 *mallees* attended the show. That among the vegetables there were good samples of turnips, carrots, cabbage-sprouts, leeks, onions, endive, spinach, lettuce, and potatoes; that prizes were offered for several vegetables, which were not forthcoming, and the amount was therefore awarded for other kinds, such as beet, celery, parsley and asparagus, for the latter in particular, not for the superiority of the article, but for its production out of season. The display of fruits was not equal to that of vegetables, but there were several baskets of very fine custard-apples, sapotas, pomegranates, lemons, pine-apples, &c. The prizes for flowers were given from Sir Lawrence Peel's quarterly donation. The competition for these was by no means spirited, and was chiefly confined to the produce of private gardens, although every publicity had been given to the native florist. The display is stated to have been tolerably fair, considering that October is not a good time of the year, either for exotics or Indian flowers, and that several heavy falls of rain were experienced only a few days before the show was held.

Resolved.—That it be referred to the Committee to report to the Society in regard to the propriety of allowing the produce of private gardens to be submitted for competition hereafter.

Formation of a Branch Agri-Horticultural Society at Simla.

A letter was read from Dr. Corbyn, announcing the pleasing intelligence of the establishment of an Agri-Horticultural Society at Simla. Dr. Corbyn states, he has been requested by the Committee to solicit permission to allow this new Institution to be considered as a Branch of the Agricultural Society of India, and to seek its assistance, if required, in the way of seeds, plants, &c. Dr. Corbyn adds, " the soil and climate of these beautiful mountains are highly congenial to the culture of most of the plants indigenous to Europe, and I have no doubt that the gardens of Simla about to be established, will be the means of facilitating the objects of our excellent institution.

Resolved.—That this newly-formed Society be admitted as a branch of this Society, and that the same assistance be accorded to it as is given to other branch institutions.

The Products of Arracan.

A long and interesting communication from Major Bogle, the Commissioner of Arracan, regarding the cotton, teak, and tobacco, alluded to among the presentations, was next read. In regard to the first article, Major Bogle mentions, that he is aware it is by no means of a good staple, and he sends it more with the view of learning what

kind of foreign cotton seed would be most likely to thrive where such was grown than with any idea of the present produce being worthy of notice. The Bourbon and Seychelles seed which was sent him sometime ago by the Society, Major Bogle states, has been all distributed among the hill tribes, who are the chief cotton cultivators, but he would be glad to get any other kind that may be better suited to a hilly country and moist climate.

The teak, Major Bogle observes, is considered to be very fine and superior to that of Moulmein; it was cut at a locality near the Kuladyne river, about 100 miles from Akyab; but from the natural obstacles opposed to the removal of the trees to the river side, he is afraid there is little hope of the timber becoming an article of trade.

Major Bogle forwards a memorandum by Capt. Phayre, regarding the tobacco, which, he thinks, will be pronounced a very superior article, and he observes, that although, as stated by Capt. Phayre, no very large quantity of the very finest kind of tobacco could be procured at present, yet he has no doubt that were the demand large and steady, the supply would be very considerable.

Communications on various Subjects.

The following communications were likewise submitted :—

1. From C. Beadon, Esq. Under-Secretary to Government of Bengal, transmitting copies of Mr. J. O. Price's reports of his proceedings during the months of June, July, and August, in the inspection of lands best suited for cotton culture in the district of Dacca.

2. From H. Hamilton Bell, Esq. enclosing a tabular statement of the return of produce per acre in wheat and barley in certain villages at Muttra, Mynpooree, and Agra, and offering a few remarks thereon.

3. From H. Rehling, Esq., in allusion to the cotton referred to among the presentations, and intimating his intention of laying out about 40 beegahs of ground for the culture of sugar cane, tobacco, wheat, &c. with the view of supplying seed to the Ryots in the vicinity.

(The above communications were referred to the Committee of Papers.)

4. From C. B. Taylor, Esq., alluding to the lac and catechu of the Palamow Jungles, and to his trials with the American maize, as follows :—

" I do not think that there is any great trade carried on either in lac or catechu, with any place, but certainly do not believe that any of the products of this Jungle enter the Calcutta market, although I find that a small quantity of both arrow-root and catechu is sometimes taken to Patna on bullocks; the distance is about 130 or 140 miles. The *River Coyle*, the Palamow River, was never navigated until I came hither.

"The American maize has succeeded well. I have obtained a large quantity of the corn from what you sent me, and next year will be able to cultivate a few fields, and to supply the people in this part of the country with seed. I have had many applications for it, but could only satisfy a few."

5. From Dr. Wm. Jameson, Supdt. of the Botanic Gardens, N. W. P., intimating his intention of complying with the request of the Society for specimens of the tea manufactured in Kemaon, so soon as a supply reaches Saharunpore.

6. From Messrs Villet and Son, of Cape Town, forwarding the Society's annual consignment of vegetable seeds per *Gloriana*, amounting to 1,430 rupees, and giving the following account of the delay in its transmission :—

"We exceedingly regret that the shipment will come to hand rather late in the season, but it is not owing to any neglect of ours, but want of opportunity direct for your port previous to the present one. The seeds were ready for shipment two months ago, intended for the *John Woodall*, but you are aware of what occurred to that vessel. In other respects, we have every reason to hope, that the present shipment will give satisfaction, the seeds being fresh and good."

For all the above communications and presentations, the thanks of the Society were accorded.